EVOLUTION OF RURAL SETTLEMENTS AND THEIR SPATIAL VARIATIONS IN MEERUT DISTRICT

ABSTRACT

THESIS

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BY

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ABSTRACT

Settlement has occupied an important place among the visual imprints made by man upon physical landscape, through the process of cultural occupancy since the dawn of civilization. The evolution and growth of settlement in an area is a result of interplay of the prevailing ecological conditions, cultural and social values of the residents, technology, management system and the settling process through time spans settlement refers to an organized colony of human beings ranging from a simple farmstead to a highly complex city and from a temporary camp of hunters or miners to more sedentary houses of farmers and city dwellers. Settlement includes not only the various kinds of buildings put to a variety of uses but also lanes, streets, roads, parks, places of worship and play grounds etc. In the initial stages settlement features bear simple forms and have close relationship with the environment. However, the growth of knowledge and spread of civilization increases the degree of variability in their form and size.

The problem of human settlements has emerged as one of the most challenging issues particularly in the under developed countries of the world. About 65 per cent of the world's population still lives in rural areas. Since the country is dominated by agrarian economy and most of the population is concentrated in villages, the study of rural settlements in India should be given prime importance.

The selection of the Meerut District for the present research is due to its uniqueness in many respects. The District lies in the fertile Ganga Yamuna doab. The District has an agrarian base and presents diverse physico-cultural and socio-economic conditions at micro-level in its different parts. It is one of the most ancient settled regions and has a long history of peopling and occupancy. Hastinapur was the most celebrated city of the ancient period. The beginning of the rural settlements in the study area goes back to the prehistoric period. Excavations at various sites of the District have revealed that the settlement in this region had begun around 1800 B.C. The earliest remains, i.e., Harappan pottery have been found at Alamgirpur. In spite of inter-mixing of various ethnic groups and cultural traits from within and outside the country the area has preserved its own traditions, culture, myths and related norms and values, which has resulted in shaping the uniqueness in its identity. It may be added that no serious study on the evolution and spatial variations of rural settlements has been made so far in the District.

The present study entitled "Evolution of Rural settlements and their spatial variations in Meerut District" is an attempt to trace the evolution of rural settlements in sequent occupancy, to examine the influence of various factors on the spatial distribution of the settlements, to analyze the shape of villages and to suggest suitable model for rural development plans, to identify rural house types on the basis of their building materials and sizes of the houses, to analyze the social morphology of selected villages (built up area) and to

examine the influence of castes as well as dominant land ownership on the spatial patterning of rural houses.

It is rather difficult to trace the multifaceted evolution of rural settlements in the study area and their spatial pattern from prehistoric, ancient and medieval eras to the modern period. This is due to the complexity of successions, absorptions and interruptions by later settlers and lack of adequate archaeological excavations in the study area. Extensive excavations in the region are practically impossible because of high density of population. The sources which are extremely helpful in providing significant clues to the understanding of the evolution of settlement patterns are archaeological findings, historical sources, written records, place names, culture, cults, folk lores, maps, field surveys and interviews.

Quantitative techniques have been used to examine the spatial distribution and types of rural settlements and shape analysis of villages in the study region.

The study is divided into six chapters. The Meerut District lies 28°32 to 29°18' north latitudes and 76°7' to 77°8' east longitudes in the state of Uttar Pradesh. It covers an area of 3911 square kilometres, out of which 3687.8 square kilometres is rural and the rest is urban. The total population of the District according to 1991 census is 3447912, out of which 2171355 people live in rural areas, which the urban population is 1276557. It is located in the

western part of the state, at a distance of 64 km from Delhi. The Ganga forms 7its natural boundary on the east and the Yamuna marks most of its western boundary. On the north it is bounded by Muzaffarnagar, on the south by that of Ghaziabad and on the southwest by the Delhi. The District has been divided into four tehsils, namely Baghpat, Sardhana, Mawana and Meerut. These tehsils are further subdivided into eighteen blocks, Chhaprauli, Baraut, Baghpat, Pilana, Khekra, Binauli, Saroorpur Khurd, Sardhana, Daurala, Mawana Kalan, Hastinapur, Parikshitgarh, Machra, Rasulpur Rohta, Jani Khurd, Meerut, Rajpura and Kharkhauda. There are 990 total villages in the District, out of which 900 are inhabited and 90 are uninhabited.

Physiographically the Meerut District is a vast alluvial plain with a slight slope from north to south or southeast. There is no uneven ground except in the area of the ravines near the river valleys and the scattered bhur ridges in the upland tract. The main features that affect the plain are the rivers whose valleys are of varying width and are on a lower level than the main upland tract. The District can be divided into four physical divisions – the Yamuna Hindan doab, the central depression, the eastern uplands and the Ganga khadar.

The principal rivers of the District from east to west are the Ganga, the Hindan and the Yamuna. The other ones are their tributaries. There are few *Jhils* of importance in the khadars of Ganga and Yamuna.

The District of Meerut experience a subtropical monsoon type of climate, which is characterized by a seasonal rythm, produced by the southwest and northeast monsoons. The reversal of the prevailing winds takes place regularly twice in a year. The winds of continental origin blowing from November to middle of June are dry while in the other parts of the year i.e., from mid June to October, they are oceanic in nature and are wet. On the basis of direction of the winds the year is divided into two seasons:

The season of northeast monsoons

The season of southwest monsoons

The direction of the winds in the region is generally from northwest to southeast during the northeast monsoon season and from southeast to northwest during the southwest monsoon season. The season of southwest monsoon is commonly known as 'rainy season' and is characterized by cloudy weather, heavy rainfall and high relative humidity. The north east monsoon remains dry barring few rainy spells on account of western disturbances but is mainly characterized by intense cold in some months and intense heat in the other on the basis of these changes in rainfall and temperature, the Indian meteorological department has divided the whole year into four seasons:

- Cold weather season from December to February
- Hot weather season from March to mid-June
- Season of general rains from mid June to September
- Season of retreating monsoon from October to November.

However the common people of Meerut District follow the agricultural calendar which recognizes three seasons corresponding with major agricultural activities.

- Cold weather season (November to February)
- Hot weather season (March to Mid June)
- Rainy season (Mid June to October)

The soils of the region are classified on geological basis under two divisions, the new alluvium and the old alluvium, also known as khadar and bhangar respectively. Casual distribution between the two is somewhat difficult but usually the older deposits occupy higher lands and the newer deposits, the lower lands in the immediate neighbourhood of the rivers.

The khadar is sandy in composition and generally high in colour. The khadar land is found in narrow strips along the rivers Ganga, Yamuna and Hindan. Bhangar or old alluvium is more clayey in composition and generally dark in colour. On the basis of texture, the bhangar soil has been subdivided into four divisions – loamy, clayey loam, sandy loam, and alkaline soil.

The District forms part of the northern subtropical deciduous type of vegetation division but as it is devoid of extensive natural negative cover.

The land use pattern reveals that about 80.33 per cent of the total area is net sown. Machra block has the highest percentage of net sown area (88.64%) while Hastinapur (68.07%). It may be marked that blocks with low

percentages of net sown areas are mostly usar infested. The area not available for cultivation in the District is 11.23% while cultivable waste and fallows comprises 4.63%. Pastures, forests and miscellaneous trees comprise 2.4% while usar and uncultivable waste comprise 1.4% of the land of the District.

There are three harvesting seasons in the region namely rabi, kharif and zaid. Rabi crops occupy 37.20% of the total cropped area of the District the kharif 56.30 per cent and the zaid occupy only 6.5 per cent.

The District enjoys the benefit of having all the three sources of irrigation rivers, canals and ground water. Out of the net irrigated area of the District, 68.96 per cent is irrigated by private tube-wells, while 5.51 per cent, 24.76 per cent 0.58 percent is irrigated by Government tube-wells, canals and masonry wells respectively.

The Meerut District occupies an important place in the industrial economy of Uttar Pradesh. All type of industries, viz., large scale, medium scale, small scale, cottage and village industries have developed in the District. There are about 30 registered units of large-scale industries.

The roadways and railways play a dominant role in the process of development in the District. The important state highways passing through the District are Meerut Bareilly Road, Meerut Bulandshahr Road, Delhi Mussoorie Road and Baghpat Saharanpur Road. The total length of the state highways in

the District is about 243 kilometres while that of metalled roads is 2356 kilometres. Out of which 1632 kilometres and 724 kilometres are in rural and urban areas respectively.

There are three broad gauge railway lines served by Northern Railways in the District. The District is also well served with an extensive network of postal and telecommunication services. There are 276 post offices located in its rural areas during 1993-94. The District has 100 public call offices in rural areas only while the telephone connections in the rural areas of the District are 681.

Rural markets are periodic markets held weekly in various villages to serve the surrounding area. The commodities sold here are food grains, vegetables, fruits, spices, cloths etc. A large majority of weekly markets are held in villages of above 500-population size.

Population is one of the most important factors determining the nature of human settlements in terms of size and economy. A perusal of the population figures of the study area indicates that since 1901 census there has been a steady population growth in the District, the only exception being the period between 1901-1921, when it registered a negative growth. This negative growth is attributed to the fact that during this period India suffered from a number of serious natural calamities.

According to the 1991 census the rural population density of the District is 588 persons per square kilometres is much higher than the national average

(267 persons per square kilometres). On the basis of calculated densities the blocks may be divided into various categories. It has been concluded that the District is an area of relatively high density of population.

In the study area, 29.24% of rural population consists of main workers, of which 74.96% engaged in primary sector, 11.3% peoples are engaged in secondary sector and 13.73% peoples are engaged in tertiary sector.

The pyramid of age-sex structure, which has a broad base and narrows quickly upwards, is young and highly fertile population. This shows that the proportion of population goes on decreasing downwards. The ratio of females per 1000 of male population in the District is 835 in 1991 census.

The District has relatively more 'never married' males than females. But the population of married males (21.35%) and married females (21.07%) are almost equal. The never married males are 31.23% while their corresponding females are 22.31% only. The incidence of child marriages in the District is not very frequent. Divorce is also not much prevalent in the study area. The proportions of widows are higher than that of widowers because of the restrictions prevalent among the Hindus on widow remarriage.

As per 1991 census the study area constitute only 51.3 per cent literacy. The percentages of literates are lower in rural areas (46.4%) than in urban areas (59.4%)

The District is dominated by Hindus (72.83%) followed by Muslims (25.30%), Christians 0.36%) and Sikhs (0.24%).

Hindi is spoken by 79.74% of the people in the District. It is followed by Urdu (19.28%), Punjabi (o.49%), Bengali (0.03%) and others (0.06%). The dialect spoken in the study area is khariboli or western Hindi. Caste structure is the most important social factor in determining the size of a rural habitation. Dwellings of the people of high castes tend to be concentrated at one place, while the low caste houses are set apart in different localities. There are a number of gradations in the hierarchy of Hindu castes. Muslim society is also divided into high and low castes. The important castes found in the District are Brahmins, Rajputs, Vaishyas, Tagas, Jats, Gujars, Chamars, Bhangis etc. Among Muslims, Sayyids, Sheikhs, Pathans, Muslim Rajputs, Muslim Tagas are found here.

The beginning of the rural settlements in the study area goes back to the prehistoric period. This is borne out by the legends and folklores of the area, the presence of a large number of mounds, and more convincingly, the archaeological excavations in different parts of the District. The abundance of mounds suggests that the area had a large number of settlements in the ancient period. Archaeological excavations show that the settlements of this region date back to at least 1800 B.C. and that the area has been under the sway of many dynasties. In order to understand the present formal pattern of the rural settlements of the Meerut District a study of its histogenesis, i.e., the evolution of its settlements, assumes considerable significance. Hence an attempt has been made in the present work to trace the evolution of the rural

settlements in the District, taking into account the place names, culture, cults, archaeological evidences, historical as well as written records, since no single evidence is strong enough to trace the evolution of rural settlements in the study area.

The study of evolution and growth of rural settlements through various periods of history indicate that the study of evolution is related to the various social, political and economic conditions of the past. It is observed that throughout the human history the settlements have evolved in relation to topography and resources of the area. The structure of rural settlements is always blended with the social and cultural history of the area in which they have evolved.

The study of place names is the subject matter of an independent, systematic discipline of typo-name. The detailed study of place names needs exhaustive work and demands careful observation of various aspects of historical geography. The place name study needs more documentary evidence of biology of domestication, archaeology, local language, traditions and customs. In the study area the analysis of place names of the rural settlements give suggestions and hints about the origin of villages. It is observed that there are many villages named after topography, soil, water bodies, flora and fauna, culture and cults and various deities. During the field studies of the District it has been found that a large percentage of the names

of the villages have suffixes or prefixes. pur, pura, nagla, garh, garhi, sarai, khora, khurd, maufi, chak etc.

Occupation of land has been a universal process in the formation of territories among corporate political groups throughout human history. Territory formation was the first step in the process of settling at lower level. During the course of land occupancy and actual settling process, emotional and historical ties developed among the inhabitants, which tended to bind them to live together in a territory. Such a territorial occupation required autonomy for the occupants to function as a viable unit. Many cultural institutions such as shrines, markets, fairs and places associated with gods and godlings came up in the course of the settling process and these made the inhabitants to feel that some places were vital for the well being of the group and must be defended. The occupied land, the shrine, the family burial ground and sites of local festivals also generated sense of belonging to the territory settlers which was shared by the non-corporate group with those of the corporate political group. As such, the territory became a complex symbol of possessiveness, means of sustenance, well-being, security and culture evolved over a period of time.

Initially, human settlements had no fixed territorial system. However, later these territories developed as clan based republics headed by their chiefs.

During the ancient period a fixed territorial system came into existence, and this has continued upto the modern period, with minor intrusions into their boundaries. In the medieval period there was a three tier political structure in almost all parts of India. At the top was the central government, in the middle was the provincial government and at the base was the hegemony of the locally dominant corporate group. An occupied territory was the primary clan areas and known as pargana. A Pargana was segmented into sub-clan or secondary clan areas known as tappas, which were sub divided into smaller territorial units known as *gaon* (*grams*). As a result of this three-tier division, there evolved a hierarchy of settlements. During the British period, five-tier territorial system was introduced i.e., the *pargana*, the *tappa* or turf, the *taluka*, the *patti* and the *gaon* in descending order. The pargana was maintained as sub-division of a tehsil and were used as revenue units, and they continue to function as such. Taluqdari and zamimdari and other territorial rights of land corresponding to them gave not only weight, but also the basis of surveys and records of holding rights. Four years after India achieved freedom, the zamindari Abolition Act was passed by the Uttar Pradesh legislature and by January 1956, and all the zamindari estates has been abolished. The Meerut District has been divided into seventeen blocks, and these have been subdivided into Adalat Panchayats, each one that has 8 to 12 villages under its jurisdiction. These units are often independent of the clan boundaries and other social ties.

Information regarding the territorial evolution of the District in the ancient period is not available. So the study is primarily based on medieval sources and particularly on the information contained in Ain-i-Akbari and various settlement reports. The zamindari clans have been a dominant factor in encouraging the evolution and growth of rural settlements in the region.

In Akbar's days the present pargana roughly correspond to the 16 mahals, which formed a part of two sarkars (Delhi and Saharanpur) in the Suba of Delhi. Of these mahals Sardhana was included in the sarkar of Saharanpur and together with the bulk of the present District of Muzaffarnagar, formed a dastur, those of Jalalabad, Barnawa, Hapur, Sarawa, Garhemukteshwar, Meerut and Hastinapur (comprising the Meerut dastur) those of Loni, Dasna, Baghpat, Jalalpur, Baraut, Kotana, Chhaprauli and Tanda Phugana.

The study about the position of the different zamindar clans between the sixteenth century and the eighteenth century, it may be concluded that there were many zamindar clans which held lands in the region. Some of the important of these clans were Jats, Brahmins, Chauhans, Tomars, Tagas, Ranghar, Chandrals, Ahirs, Gujars, Sheikhzadas, Afghans, Pathans and Sayyids.

A study of these zamindar clans between the sixteenth century and the nineteenth century, it may be concluded that the Rajputs, who were once

dominating in the District, were reduced to the second position and that Jats extended their zamindari considerably to gain the first position in the District, and that the Gujars, Mahajans and Thuggas, who were not on the scene in the sixteenth century appeared as the dominant clans. Brahmins and Tagas also lost their holdings in 1874.

The evolution of rural settlements in sequent occupancy in the Meerut District has been studied under four periods i.e., prehistoric, ancient, medieval and modern. Excavation at various sites of the study area have revealed that settlements of this region began around (2000-1800 B.C.). The earliest remains, i.e., pieces of Harappan pottery have been found at Alamgirpur. Then successive remains of different periods, ochre coloured wares (OCW, 1800B.C.-1200B.C.), painted grey ware (PGW, 1200 B.C.-800B.C.), Northern black polished wares (NBPW, 800-200B.C.) have been recovered from different places in the District. A large ruined brick stupas and temples indicate that this place was once a Buddhist centre. Pieces of sculpture belonging to the Kushana period have been recovered from Hastinapur. Few remains of the Gupta period also found in the District. The images of Post Gupta period are still being worshiped in village temples at many places in the study area. A large number of pieces of pottery and sculpture of the medieval period have also been recovered from different mounds in the study area.

It is clear from the foregoing discussion that the region was continuously settled from the prehistoric to medieval period, though it is very

difficult to trace the patterns of settlement during the different periods until extensive excavations have been conducted.

Though Aryans had completed their colonization by the end of seventh century B.C., the region was affected by the migration waves of Rajput clans at the beginning of twelfth century A.D. Migrations of various other corporate groups or clans followed the Muslims invasions in 1194 A.D when Qutubuddin Aibek captured the fort of Meerut. From that time migration of Muslims continued upto the eighteenth century. In this way a distinct pattern pf socio-economic and cultural territorialization emerged in the study area. It is true that many of the rural settlements of today in the District do not appear to have been established on a planned basis. They appear to have just grown. During the Muslim period the villages of the study area remained practically unchanged as Muslim preferred to live in towns rather than in the countryside. Even with the establishment of the British rule the village type remained almost the same, although the need for living within the village wall was no longer felt by the people due the establishment of peace and security in the country. Since the beginning of the twentieth century, the diversification of industries, development of transport and communication facilities has together contributed to the growth of many settlements in different parts of the District.

After independence (1947), rural settlements in the study area witnessed a general tendency of dispersal because of changed economic conditions, loss of the hold of traditional as well as socio-religious beliefs and

customs and abolition of the zamindari system. The consolidation of land holdings, the extent of the means of transport and communication, electricity, irrigation, banking and marketing facilities to the rural areas, improvement in the methods of farming, have all contributed to this trend in recent years. The phenomenal increase of population and consequent demand for more land for farming for faming and housing and housing have not only led to the widespread shrinkage of forest cover but also to the reclamation of barren lands. The new administrative institutions like development blocks, and village panchayats and public buildings belonging to primary schools, rural health centres, panchayat bhawans (village council house), community centres etc., have led to a change in the rural landscape of the study area. A large number of new settlements have grown around these centres under programme of providing house-sites and credit facilities to Harijans and landless labourers.

The study area, forming part of the Ganga Yamuna Doab, owing to its homogenous relief and fertile alluvial soils, has an almost uniform distribution of rural settlements. However, slight variations may been seen at micro-level due to differences in local relief, sources of water supply, drainage lines, soils, patterns of land use, transport facilities, social attributes and population density etc. Factors like deeply cut ravines, *usar* lands, ill-drained soils, proneness to floods and non-availability of drinking water etc. on the one hand, and *bhangar* lands, well drained fertile soils and availability of fresh water, on the other hand, have also militated against strictly uniform

distribution of settlements in the District. The size (area and population) and density of rural settlements is closely related to spacing. With increase in distance between settlements the density of villages tends to decrease. In the study area the average areal size of village is 4.15 Km^2. The highest per village areal coverage (6.741 Km^2) is in the Chhaprauli block of Baghpat tehsil while the lowest areal size (2.884 Km^2) is found in Meerut block of Meerut tehsil. The average population of a village in the study area is 2534.52 persons. The highest per village population is found in Chhaprauli block i.e., 4404 persons while the lowest per village population are found in Hastinapur block (1099 persons). The villages of the study area have been classified into six population groups. There are 50 villages i.e., (5.56 per cent villages) of the study area inhabited by less than 200 people whereas 53 villages comprising 5.89 percent of villages contain between 200 and 499 persons. The medium size villages (500-999) account for 13.22 per cent of the total number of villages i.e., 119 villages while large villages (1000-1999) share 26.89 per cent of the villages i.e., 242 villages. Very large villages with population ranging between 2000 and 4999 are large in number and constitute 38.77 per cent of the total number of villages of the study area. The exceptionally large villages, inhabited by more than 5000 persons represent 9.67 per cent of the total number of villages in the study area. The village density in the study area varies from 14 to 34 villages per 100 Km^2. The average spacing i.e., inter village distance for the study area comes to be 2.175 Km. The inter village

spacing at block level have also been grouped into five categories as, very low, low, moderate, high and very high. The study also reveals a direct relationship between spacing and settlement size in different blocks of the region. It is concluded that where spacing is high villages are of larger sizes with a smaller number of hamlets having higher densities of population, which results in compact structure of settlements. On the contrary in areas of low spacing, settlements are generally smaller in size with low pressure of population and scattered distributional pattern, viz., hamleted types of settlements. The R_N values ranging from 0.803 (Hastinapur) to 1.389 (Meerut) reveals a clear tendency towards regularity. The R_N values have also been categorized into five groups as, clustered grouping, random grouping, low, moderate and high regularity. It has been concluded that the trend of dispersion is always towards regularity. So Dacey's "Regular Poisson Probability Law" is appropriate in this case because the empirical variance mean ratio is always smaller than 1 and the mean, in every case, is more than the variance.

The settlements are the study area has been classified into three types according to the spatial arrangement of the houses, i.e., compact, semi-compact and hamleted. The compact settlements show very spatial organization of the houses. The hamleted settlement indicates scattering of occupance units along the loose spatial structure. The semi-compact is an intermediary stage between compact and hamleted settlements, is

characterized by the presence of a main village site along with one or two or more hamlets. Various factors affecting rural settlement types have also been discussed. These factors are of both agglomerative and deglomerative nature.

The pattern, shape or the arrangement of the settlements is solely determined by physico-cultural and socio-economic conditions of the region. The term 'pattern' is often equated with the term 'shape'. However there are geometrical dissimilarities between these two terms. A closed curve has a shape whereas a non-closed collection of point has a pattern. Settlement pattern denotes the shape or arrangement of settlements in relation to natural or man-made features such as steams, ridges, canals and roads etc. Patterns of rural settlements of the study are influenced by physico-cultural factors, state of insecurity in the past, and the present social ethos of the rural society. On the basis of qualitative or classical approach, a number of settlement patterns have been identified. Rectangular and square settlement patterns are the characteristic features of the entire study area. The geometrical or quantitative approach of shape analysis is based on the elementary packing theory. The circle is considered to be an ideal geometrical figure owing to its maximum packing capacity, compactness and better accessibility. Hence, the circular geometry has been used for the computation of shapes in the present analysis. A study of the village shapes of 90 sample villages of the District shows the predominance of rectangular and square pattern. This is mainly due to the rectangular system of land division, i.e., the *bigha* system, prevalent during ancient times.

The second basis of shape analysis is the number of contacts between a village and its neighbouring villages. The mean contact number of sample villages is 5.422, which is very near to 6, a feature of a strictly hexagonal system. This is further corroborated by the fact that 63.3 per cent of the sample villages record contact numbers between 5 and 7.

There appears to be no correlation between contact index, population density and shape index, because of its homogeneous nature of the study area. Transformation of villages shapes takes place in order to minimize the transport cost, to bring territorial limits of a village within easy reach of the villages sites and to accelerate the pace of economic progress and modernization. For the transformation of villages shapes, three areas from discrete ecological setting have been selected and suggestions have been made, using Thiessan's polygons and Hexagons of varying 'K' values for the rural development plans.

Rural dwelling constitute the basic elements of cultural landscape and occupy an important place in the geographical analysis of human settlements. They provide a clear evidence of the complex relationship between man and his environment. The distributional pattern of rural dwellings generally follows the pattern of rural population distribution and is determined by the ecological condition of a region. According to 1991 census, there are 3,18,185 rural houses in the District, with an average density of 86.28 houses per square kilometres. The maximum and minimum densities 119.78 houses per sq km

and 42.93 houses per square kilometres are found in Rajpura and Hastinapur blocks respectively. House types of the study area have been classified on the basis of their building material and sizes and shapes. They study reveals that mud and unburnt brick wall with thatched and mud roof houses constitute 29.5 per cent of the total rural dwellings, Burnt brick wall with thatched roof cover 41.5 per cent while burnt brick walled houses with burnt brick, stone and lime roof dwellings (pucca dwellings) cover about 1.45 per cent of the total number of rural dwellings, while rest of the dwellings consists of mixed materials used in walls and roofs.

The size of a dwelling reflects the economic condition of the dweller and the size of household. The sizes of the houses in the study area vary from political buildings to the single room huts, which marks the difference between the rich and poor. One and two room dwellings together constitute more than 63 per cent of the total number of rural houses of the District and offer shelter to 59.4 per cent of its total rural population. The three and four rooms dwellings, which are nearly 26.21 per cent of the total rural houses in the study area, provide accommodation to over 28.39 per cent of the total rural population. Mostly the rural houses in the study area are multipurpose one, used for sleeping, keeping cattle, storing fodders etc. Generally the housing condition and village environment are far from satisfactory. The houses are constructed in close proximity to one another, allowing little ventilation. There are many big pits full of contaminated water near the inhabited sites emitting

foul smell, which causes diseases and infections. A few suggestions have also been given to improve the housing conditions and village environment of the rural area of the Meerut District.

The morphological structure of the sample villages in the study area is mainly determined by their socio-economic as well as physical attributes. Land ownership and caste system have played a crucial role in determining their spatial morphological structure. Study of sample villages have shown that Brahmins, although they occupy the highest rank in the social hierarchy, do not hold the central or the best available sites of these villages, whereas people of the second and third order of the social hierarchy, such as Kshatriyas and Vaishyas, occupy the central or best available sites. Usually they have the largest landholdings in the villages. The lowest strata of the rural society, namely, people belonging to the scheduled castes generally live in congested residences on the periphery of the villages, away from the highest castes dwellings. At times caste-based hamlets have been developed within the village territory having caste names like Ahiran, Kurmiyan, Chamartola, or Jataula. The stigma of population creates a sense of ritual distance between different castes and determines the spatial arrangement of their respective dwellings in the villages. Traditionally there is a Brahmins-untouchable ritual continuum in which other caste groups occupy different positions based on their respective social status. Brahmin and Shudras, having their discrete social relevance, were placed at the two ends of the

continuum. But with the spread of education, enforcement of social laws and functional ties, the rigidity of the caste system is gradually losing its force of attraction, with the results that certain changes in socio-spatial structure of the villages seems to be emerging.

The analysis of the spatial patterning of houses of different castes reveals those caste inhabitations contemplates the people of different castes to live in separate settlement units. However, the latest houses of the low caste people are built near the residences of the higher caste people, in these sample villages, owing to the growth of population and changes in the socio-economic conditions.

In the last conclusions have been drawn and some suggestions have been made in connection with the betterment of the village environment.

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CERTIFICATE

This is to certify that Ms. Ghazala Hameed has pursued her research work and prepared the present thesis entitled "**Evolution of Rural Settlements and their Spatial Variations in Meerut District**", under my supervision and guidance. This thesis is her original work and is being submitted to the Aligarh Muslim University for the degree of Doctor of Philosophy.

(Dr. Ateeque Ahmad)

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(Ms. Ghazala Hameed)

DEDICATED

TO

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INTRODUCTION

INTRODUCTION

All living organisms build for themselves some sort of shelter for safe rest. For shelter, man selects tree branches, caves or pits or rock cut hiding places. These shelter places become the most concrete expressions of human cultural activity and assume various forms as well as names like houses, dwellings, abodes and habitations. These all form human habitat more specifically settlements. Settlements occupy an important position among all the visual imprints made by man upon the physical landscape through the process of cultural occupancy since the dawn of human civilization.

The study of settlements forms one of the most important themes of human geography. The term 'settlement' is generic and of multiple connotation and varying use. In the Oxford Dictionary the 'settle' means to establish or become established in more or less permanent abode or way of life while its derivatives noun form (settlement) means 'the act of settling down'. Settlement thus means an establishment and abode with an established way of life.

The geographical study of rural settlements begins with Ritter's work in the early nineteenth century. Since then both the content and the methodology of this study have been developed principally within a German and French context while in England rural settlement geography is a

relatively recent branch of human geography. During the sixties, Stone suggested that 'geography of rural settlements be defined as the description and analysis of the distribution of buildings by which people attach themselves to the land for purpose of primary production.[1] But he excluded some significant constituents like building materials, architectural styles, land use and fence types. A year later, his ideas were challenged by Jordan who defined settlement geography is the study of the form of the cultural landscape involving its orderly description and attempted explanation. Later on he emphasized three aspects of the cultural landscape:(i) the settlement patterns or distribution of farmsteads, (ii) the field pattern, or the form resulting from division of land for productive use, and (iii) house and farmstead type including the building materials and folk architecture.[2] This definition was internationally accepted without any hesitation.

R.L. Singh is of the opinion that settlement geography deals with the facilities built in the process of human occupance of land and their grouping. The nature and distribution of these facilities are related to the art and mode of living on the one hand and on the other to such physical factors as water supply, slopes, forests and swamps. These are designed and grouped to serve specific purposes, and as such carry functional

1. Stone, K. H., "The Development of a Focus for the Geography of Settlement" *Economic Geography*, 41, (1965), pp. 346-55.
2. Jordan, T.G., "On the Nature of Settlement Geography", *Professional Geographer*, Vol. 18, No. 1, 1966, pp. 26-28.

meaning. Houses and highways, the two basic facilities of settlement, are topographic expressions of their grouping or arrangements. Their external forms reflect architectural styles of their time and thus they reflect changes in human occupance of an area, often being the only relict of expressions of the past cultural landscapes. Settlement as an occupance unit represents thus an organized colony of human beings, including the buildings in which they live or work or store or use them otherwise and the tracks or streets over which their movements take place. Even their rudimentary forms as expressed by the temporary camps of the hunter or the herder, including the one-wall houses of Semangs of Malaya, reflect some human ingenuity and its act of the environment. Thus the centre of interest in settlement geography is man and the reciprocal relationships between human occupance features and environment.[1]

Settlement geography, being an offshoot of social geography[2] or a recent most sprout from the venerable trunk of human geography[3] was mainly concerned with urban settlements before the turn of the twentieth century. But, since about two-thirds of the world population and about 66 per cent of the total settlements occupy rural areas, many historians, sociologists and geographers have studied rural settlements and the problems attached with environmental aspects in rural areas. Even

1. Singh, R.L., "Meaning, Objective and Scope of Settlement Geography", *National Geographical Journal of India*, No. 7, 1961, pp. 12-20.
2. Hudson, F.S., *A Geography of Settlements*, Second ed., Macdonald and Evans, 1976, p. 10.
3. Singh, R.L., *ibid.*, p. 12.

urbanized world still possesses varied forms of rural settlements. Thus, a comprehensive study of settlements requires explanation of site and situation, building materials, forms including architectural style, functions, types and patterns, and characteristics. Of these, site and situations and materials need full interpretation of physical and cultural linkages while morphology requires in-depth study of sequent occupance involving historical background. As the past is the key to the present and we walk to a certain degree in every village among the ruins of antiquity[1], that involves archaeological analysis to understand the ground reality. The place name study serves remarkably in reconstructing the sequent occupance.

The range of subject matter varies from herder's hut in a pioneer fringe to a skyscraper in New York. Obviously, the city geography is at one end of the scale of settlement, pioneering at the other.[2] Keeping this view in mind, the totality of the human community in rural areas includes the social, material, organizational, spiritual and cultural elements are necessarily required for sustaining of human living. Under physical requirements as housing, work, energy supply, transport, communication, water availability, education, health, protection and social welfare, system of territorial organization, local self-government, law and economic management and cultural facilities for the development of art, recreation and leisure come under his study. Further, with the growth of population, increasing migration

1. August Meitzen (1985), Siedlung and Agrarwesen der Westgermannen ... in his series entitled *Wandering, Anba und Agrarecht der Volker europas Nordlich der Alpen*, Berlin: W. Hertz, Vol. 1, p. 28.
2. Bowman, Isaiah, (1953), "Settlement by the Modern Pioneer", *Geography in the twentieth Century*, second edition, Ch. XI, pp. 266.

to rural to urban areas and vice versa, the demand for housing construction for rehabilitation of displaced persons from natural and human born calamities such as earthquakes, floods and sense of insecurity caused insurgency, communal violence etc. are developing wider scope of rural settlements which requires an integrated approach for rational planning and development.

Approaches of Rural Settlement Studies

Three basic approaches of studies are employed in rural settlement geography.

Genetic Approach

The genetic approach of settlement studies was pioneered by Meitzen (1895). In the 20th International Geographical Congress Symposium (London, 1964), it was emphasized that the scientific study of settlements must be founded on an appreciation of the nature and limitation of historical perspective, whether archeological or documentary. As the core concern of settlement geography is the spatial arrangement and sequent occupance, the histogenetic approach is most appropriate for studying the degree of continuity of territorial organization and problems of interaction between man and environment. Three basic attributes, i.e., retrogressive, retrospective and prospective are very common for historical perspectives of rural settlement studies. Bloch advocated the first attributes in this context. According to him, retrogressive method is focused upon the past

on the basis of the evidences gathered from the recent past.[1] The second approach, i.e., retrospective, advocated by Roger Dion focuses upon the present, the past conditions regarding settlements being considered for better understanding of the existing state.[2] The third approach, i.e., prospective, concerns itself with the future, the past and present settlement forms being regarded as relict features for adjustment with future probable needs.[3]

Place name studies, inter alia are significant approach for reconstruction of cultural landscape through sequent occupance.

Study of settlements on the basis of diffusion theory is also a significant approach followed by various geographers. Analysis of abandoned settlements, a new approach, provides conclusive evidences about the past settlements and human activities. This approach developed out of archeology, it consists of three parts: (i) chemical analysis of soil phosphorous indicating human occupance, (ii) microseparation examining soil and settlement components primarily through mechanical means and (iii) polynology (pollen analysis). Eidt presented interesting findings in his studies.[4]

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1. Bloch, M., *The Historian Craft*, London, (1954), pp. 43-47.
2. Dion, Roger (1949), 'La geographic humaine retrospective' Catriers Internationaux de Sociologie', 6, pp. 3-27.
3. Julliard, E. (1964), 'Geographic rurale francise Travaux (1957-63) et al tendance novelist' Etudes Ruraler, 1314, pp. 46-70.
4. Eidt, R.C. and W.I. Woods, (1974), Abondoned Settlement Analysis, Theory and Practice, Wisconsin: Field Test Associates.

Spatial Approach

Spatial organization approach is a form of system approach, which helps in comprehending the settlements as a whole. It may be analyzed through different concepts, among which very pertinent in rural settlement geography are (i) type, pattern and classification, (ii) functional integration and hierarchy, (iii) local identity (e.g., village structure), and (iv) planning and rationalization.[1] Demangeon[2] actually developed the concept of spatial organization in context to morphological structure. He presented the classification of French grouped settlements into different types according to shape. His works paved the way for geographers to produce regional classification of rural settlement types. Schaefer[3] initiated the modern orientation following the works of German geographers. Modern geographers are following him in the study of settlements through the analysis of patterns and processes as they express the spatial organization in environmental space. Through this approach the interrelationship of man, nature and society is better expressed in any cultural landscape. A number of studies on morphology, size and shape of settlements speak some sort of organization of space ranging from a room, hamlet, town to the far off settled megalopolis.

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1. Singh, R.L. et al. (1975), *Readings in Rural Settlement Geography*, National Geographical Society of India, Varanasi, Publication, No. 14, p. xi.
2. Demangeon, A. (1920), L' Habitation Rural in France' *Annales de Geographie*", 29:352-357,
3. Schaefer,F.A.. (1953), Exceptionalism in Geography, AAAG, 55, pp. 549-577.

Ecological Approach

The ecological-cultural approach finds its strength through the study of plant ecologists. Plant ecology theories are being applied to explain the process of change in human behavior and settlements over time. Radha Kamal Mukerjee regarding adaptation of human society and ecology produced a fundamental work.[1] The settling process as described by Hudson[2] includes three phases-colonization, spread and competition– similar to plant communities in space. He concluded that this process follows a cyclic way temporarily. Since much of the human behavior is of sub-optimal nature,[3] people in various habitats are often with less than the ideal. Such habitats have been studied by many geographers including Kayastha[4] and Singh.[5]

The most significant theoretical framework of settlement formation has so far been developed by C.A. Doxiadis.[6] He sets five principles, illustrated with hypothetical diagrams (Fig.i). The first principles is the maximization of man's potential contact with natural elements, (e.g., water,

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1 . Mukerjee, R.K. (1940), *Man and His Habitations: A Study in Social Ecology*, London.
2 . Hudson, J.C. (19690, A Location Theory of Rural Settlements, *AAAG*. 59:365-381.
3 . Pred, A. (1976), *Behaviour and Location, Lund Studies in Geography*, Series B., No. 27, p.28.
4 . Kayastha, S.L., (1957), *Gaddis of Dhauladhar-A Study in Himalayan Ecology*, Vol. III, part 2, pp. 65-78.
5 . Singh, R.Y., (1972), *Bhils of Malwa Region-Their Habitat, Economy and Society*, Vol, xviii, parts 3&4, pp. 223-239.
6 . Doxiadis, C.A. "The Future of Human Settlements" in *the place of value in a world of facts*, eds. Tiselius A.and S.Nilsson, Stockholm: Almqvist and Wiksell (1969), pp. 307-338.

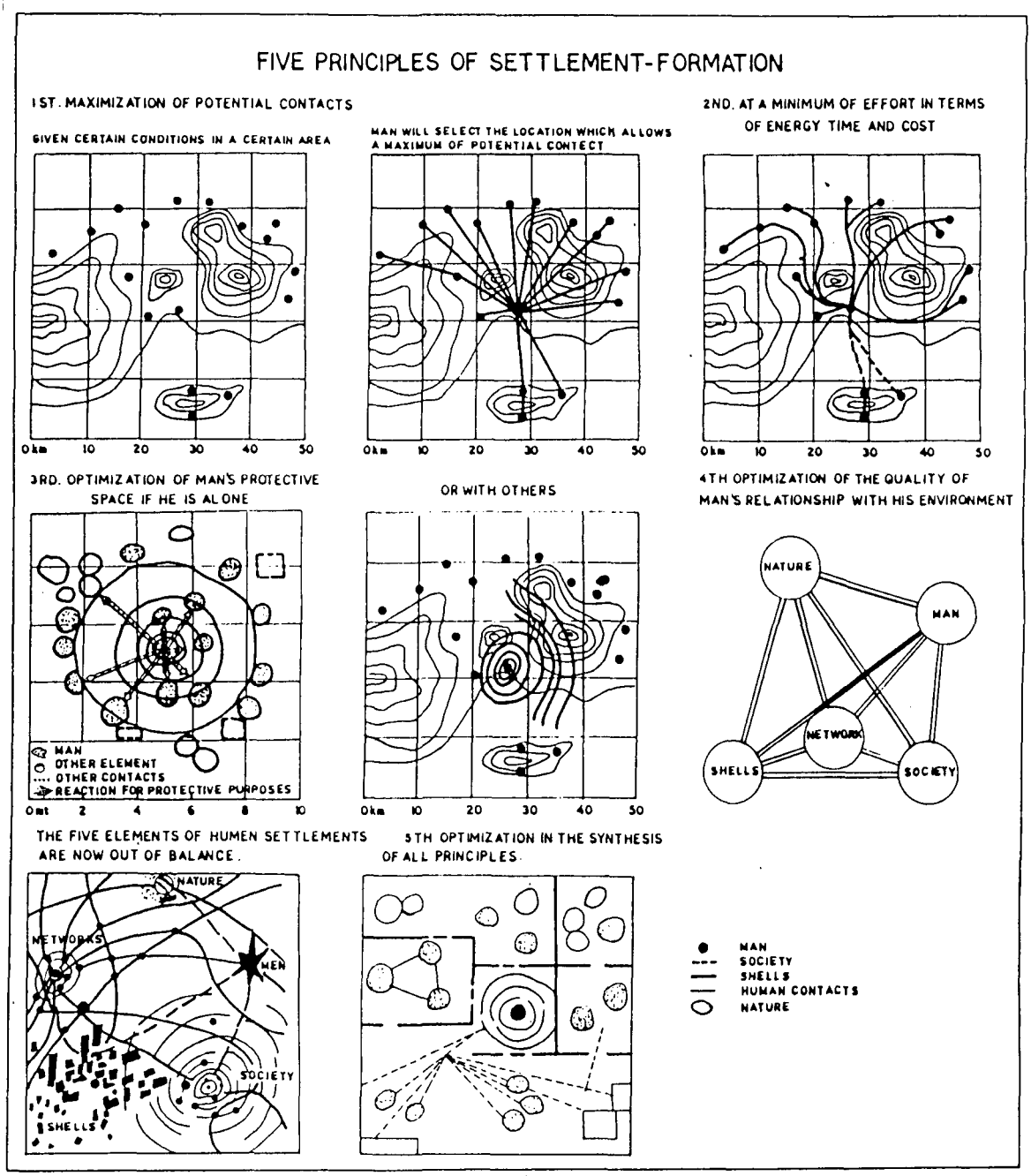

FIVE PRINCIPLES OF SETTLEMENT-FORMATION
1ST. MAXIMIZATION OF POTENTIAL CONTACTS
GIVEN CERTAIN CONDITIONS IN A CERTAIN AREA
MAN WILL SELECT THE LOCATION WHICH ALLOWS A MAXIMUM OF POTENTIAL CONTECT
2ND. AT A MINIMUM OF EFFORT IN TERMS OF ENERGY TIME AND COST
0km 10 20 30 40 50
3RD. OPTIMIZATION OF MAN'S PROTECTIVE SPACE IF HE IS ALONE
OR WITH OTHERS
4TH OPTIMIZATION OF THE QUALITY OF MAN'S RELATIONSHIP WITH HIS ENVIRONMENT
MAN
OTHER ELEMENT
OTHER CONTACTS
REACTION FOR PROTECTIVE PURPOSES
0mt 2 4 6 8 10
NATURE
MAN
NETWORK
SHELLS
SOCIETY
THE FIVE ELEMENTS OF HUMEN SETTLEMENTS ARE NOW OUT OF BALANCE.
5TH OPTIMIZATION IN THE SYNTHESIS OF ALL PRINCIPLES.
NATURE
NETWORKS
MEN
SOCIETY
SHELLS
MAN
SOCIETY
SHELLS
HUMAN CONTACTS
NATURE

FIG. 1

trees, etc.), with other people cultural elements (e.g., buildings, roads, etc.). The second principle is the minimization of efforts required for the achievement of man's actual and potential contacts, according to the general principle of least effort. The third principle is the optimization of man's protective space at every movement individually or in a group, in any situation or locality, whether it is temporary or permanent, whether he is alone or part of a group. The fourth principle is the optimization of the quality of man relationship with his environment, consisting of nature, society, shell (building and houses of all sorts), and networks (lanes, street, road, communications, etc.,). The fifth principle is that man organizes his settlements in an attempt to achieve an optimum synthesis of the previous four principles. This optimization works naturally through time and space, as well as the prevailing conditions and man's ability to create a synthesis.

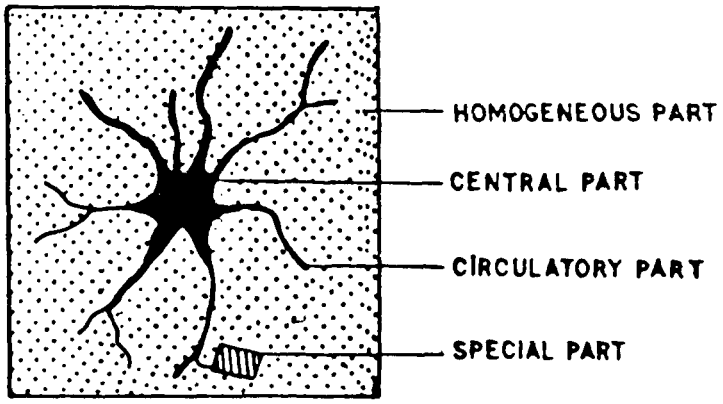
Apart from space articulation or territoriality, there are also other pertinent factors, which are capable of general application. Doxiadis has developed a four fold frame which can be applied to composite individual settlements of all sizes and a territory as well as to its constituently (Fig. ii). Hypothetically, any settlement consists of four parts: (i) homogeneous part, (ii) central part. (iii) circulatory part and (iv) special part. These parts are always subject to change but they are always present in a living settlement.[1]

---

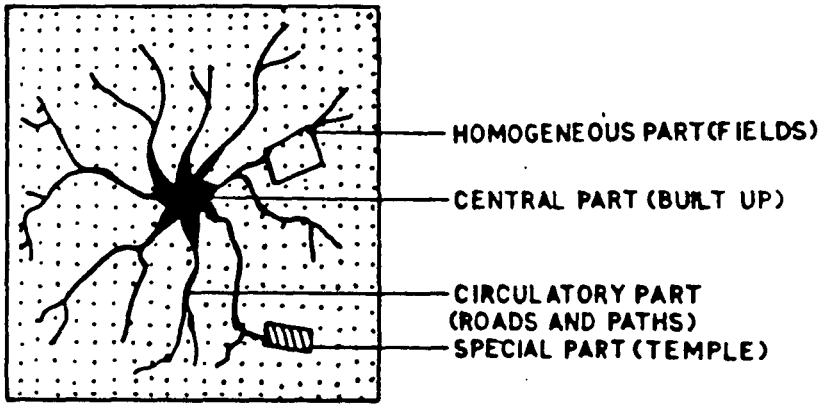
1. Baker, A.R.H., 'The Geography of Rural Settlements', in *Trends in Geography: An Introductory Survey*, (eds.,), Cooke, R.H. and J.H. Johnson, London, (1969), pp. 323-326.

PARTS OF HUMAN SETTLEMENTS

ANY SETTLEMENT CONSISTS OF:



A VILLAGE CONSISTS OF:



THE BUILT UP AREA OF THE VILLAGE CONSISTS AGAIN OF:

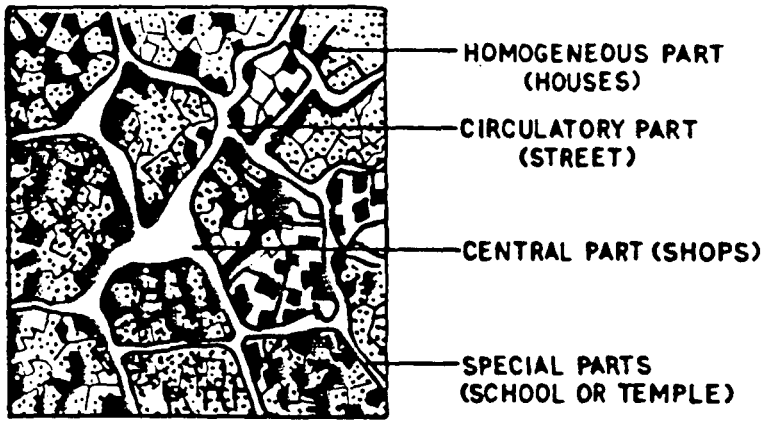


FIG. 11

Review Work Done so far

A brief review of the work is presented in sequent manner, early description of human settlements are found in the works of Herodotus[1] (440-25) B.C., who wrote about settled places and about the custom of their inhabitants. Strabo[2] (63 B.C–A.D. 20) may be remembered to have been concerned with the occupance of the land and its dwellings.

Moser[3] (1780) makes an important methodological contribution to settlement analysis after carrying out field investigation of life in northern Germany, he describes individual farm houses and the functions of farm structure and fields, as well as the influence of tradition on settlement pattern.

Arnold[4] (1875) states that place names and history are important for establishing the order of settlement stratification, and that this provides an indirect basis of assessing the factor in the location in the villages.[5]

Finch and Trewartha (1942) mention a number of factors, which determines the pattern of settlements like topography, elevation and slopes, nature of soil, forest, area distribution of nature, existence of springs that contribute to dispersal.[6] Stanislowsky (1946), state that Latin Planning

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1. Godley, A.D., *Transl-Herodotus,* Vol. 4, Cambridge Mass, (1946).
2. Jones, H.L., *Transl. The Geography of Strabo,* Vol. 5, (1917-1932).
3. Moser, J., *Osnabruchische Geschiete, Theel mit Urdenden*, Berlin, 2nd ed. (1780).
4. Arnold, W., *Ansiedlungen Und Wanderungen deutscher stamme Zumieist nech Hessischem Ortsnaman Marburg,* (1875).
5. Ali, S.M., "Population and Settlement in the Ghaggar Plain", *The Indian Geographical Journal*, Vol. 17, No. 3, (1942), p. 163.
6. Finch and Trewartha, "*Elements of Geography, Physical and cultural*", New York (1942), p. 41.

methods were later extended to the new world by the Spanish and the Portuguese who had centuries of experience and operating vilas, pueblos and Ciudades from Roman Structures.[1]

Blache (1952) has found that the concentration and description are the results of physical influence on human environment.[2] He further states that human being select lines to contact between different geological formations and varieties of topography give new and favourable opportunity for their settlement. There is a marked tendency to converge or even to concentrate at the angles of slopes or at the intersection of different gradients.[3] Again he says that the agglomeration of settlements itself becomes a locational force for the establishment of settlement. The sum total of human need is after all only a certain amount of variety of food supply, animals, fuel and building materials and so on.[4]

Ahmad[5] (1952) made a commendable study of the rural settlement types in Uttar Pradesh. He grouped the rural settlements in the types – compact cluster and hamlet, fragmented or hamleted and dispersed settlements. He observed that religious belief and superstitions also exert pressure on the location of rural settlements in the Ganga Yamuna Doab.

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1. Stanislowsky, D., "The Origin and Spread of the Grid Pattern Towns", *Geographical Review*, (1946), Vol. 36, p. 105, 1.
2. Blache, p., *Vidal de la, Principles of Human Geography*, London (1952), p.317.
3. *ibid.*, p. 238.
4. *ibid.*, p. 281.
5. Ahmad, E., Rural Settlement Types in Uttar Pradesh, *Annals of the Association of American Geographers*, Vol. XIII, No. 3, September, 1952.

Villagers generally avoided a new site for a house as far as possible. Houses can be built on a new site only after the sanction made by the priest. Moreover the ancestral site of a house is usually regarded as sacred unless the family is in decay. Extension of a settlement on the south and west is forbidden, these two directions being considered inauspicious.

Brunhes[1] (1952) defines settlement pattern by using the term 'nucleated' instead of 'compact' whereas Blache and Finch called it 'clustered' and 'Compact' respectively.

Anas[2] (1954) has found that village and hamlet tend to avoid the low laying areas liable to inundation and seek dry points on some mound or elevated price of land.

Mukerji[3] (1954) has discovered that clan solidarity of Jats and Gujars have held them together on compact sites. The Jats have everywhere captured the best lands. Their farms have the best soils and are located in first assessment circles adjoining the villages.

Clark and Evans (1954) have devised a new quantitative technique e-g measures pattern of rural settlements.[4] This is called the nearest neighbour technique.

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1. Brunhes, J., '*Human Geography*', London 1952, p. 71.
2. Anas, M., 'The Pattern of Human Settlement in the Sub-Himalayan Region (East), *The Geographer*, (1954), p.28.
3. Mukerji, A.B., Jats: A Study in Human Geography', *Geographical Review of India*, Vol. 16, No. 2, June (1954), pp.18-19.
4. Clark, P..J. and Evans, F.C., ' Distance to Nearest Neighbour as a Measure of spatial Relationship '. *Population Ecology,* Vol. 35, 1954, (pp.44-45).

Buschman [1] (1954) investigated into the inter relationship between the settlement patterns and the house types in different regions of India.

Singh (1955) has gone through temporal analysis of village pattern and says that when one speaks of the village plan one refers to the layout of a basti (inhabited site) resulting from the arrangement of houses and village streets or lanes.[2]

Singh (1955) has also analysed the spatial pattern of the society and culture, particularly with emphasis on clan organization against the geographical background, which has been further elaborated in his later works. He has tried to trace the progress of some Rajput clans from their migratory stage to settlements.[3]

Thomson (1956) has applied the nearest neighbour technique in his study of the distribution of population.[4]

Bhattacharya (1956) made a study of settlement patterns in the Upper Ganga Plain of Uttar Pradesh and attributed agglomerated pattern to caste affinities.[5]

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1 . Buschman, K.H. 'settlements and Habitations in India', *Geographical Review of India*, Vol. XVI, No. 3, 1954.
2 . Singh , R.L., ' Evolution of settlement in the Middle Ganga Valley ', *The National Geographical Journal of India,* Vol. 1, Part II, 1955, p. 109.
3 . *ibid*, pp. 70-14.
4 . Thomson, H.R.,' Distribution of Distance to Nearest Neighbour', *Population Ecology*, Berlin, 1956, Vol. 37 pp. 391-394.
5 . Bhattacharya, N.D., 'Rural settlements of Murshidabad West Bengal', *The National Geographical Journal of India*, Vol. XII , 1954, p.4,

Bradford (1957) focuses on settlement planning and says that Romans were much interested in it and had evolved a well-organized quadrate system.[1]

Finch and Trewartha (1957) define the nucleated settlements as those which have all the dwellings of a mauza concentrated in one central site to form compact settlements, houses being clustered with each other. They called these settlements 'nucleated' or 'compact' while Blache calls them ' clustered' [2] He also says that there is a close relationship between the relief features and the location of rural settlements and that dispersion increases in direct proportion to the ruggedness of the surface of the land.[3]

Bertrand (1958) observes that the strong Kinship relationships are major characteristics of the social structure in many rural areas of the U.S.A. Individual section of a dwelling site is primarily influenced by the location of the residence of another number of the family.[4]

Blache (1959) calls concentrated dwellings of a mauza in one central site of a compact settlement.[5]

Singh (1961) defines settlement as an occupance unit representing an organized colony of human beings including the buildings in which they live or work or store and the tracks or streets over which their movements

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1 . Bradford, J., *Ancient Landscapes, studies in Field Archeology*, London, 1957, p.152.
2 . Finch and Trewartha, *op. cit.* , P . 548.
3 . Trewartha, *op. cit.*, p. 545.
4 . Bertrand, Alvin, *Rural Sociology*, New York, 1958, p.337.
5 . Blache, *op.cit.* p. 289.

take place. Even their rudimentary form as expressed by the temporary camp of the hunter or herder including the one wall house of the Semangs of Malaya reflect some human ingenuity with an imprint of the environment.[1]

Yonekura (1961) made a comparative study of the rectangular village pattern in South India and Japan, and concluded that no single natural factor decides the village patterns. Regarding India's Villages he observed that they are generally agglomerated in type like that of East Asia.[2]

Bose (1961) observes that as such a settlement does not have any particular shape, it is known as irregular or amorphous. He called such a pattern a shapeless cluster.[3]

Ahmad (1962) states that villages differ greatly from one another in shape and pattern by reason of contrast in the arrangement of streets and houses. As a matter of fact, the street system within a settlement is its most essential element. When houses are built in groups, the street often plays the decisive role and the houses face not the east nor the west but the highway the street or the road, Besides the street system other cultural

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1. Singh, R.L., 'Meaning, Objectives and Scope of settlement Geography', *National Geographical Journal of India*, Vol. 7., (1961), pp.12-20.
2. Yonekura, J., 'Comparative study of East Asian and Indian villages', *The Geographic Review of India*, Vol XXIII , No. 3., 1961.
3. Bose, N.K., 'Peasant Life in India, A Study in Indian Unity and Diversity , *Anthropological Survey of India*, Memoir , No. 8, 1961.

elements such as a temples and mosques give a peculiar character to dwelling site.[1]

Dacey (1962) focuses his attention on settlement pattern for which he adopts the Nearest Neighbour Distance technique.[2]

Chisholm (1962) observes that the religious minded have staunch faith in the existence of God or Deity, which sometimes is the basis of all settlements.[3]

Ahmad (1962) says that village ponds are great sources of water supply for drinking purposes for the cattle. Construction of houses and minor irrigation facilities in the nearby cultivable land. There is hardly a village without a pond in the entire Doab region . Ponds are the centres of rural activity where women come to fetch water and men to water their cattle. A few trees are grown near the ponds to provide shelter against the scorching heat of the sun. Thus these ponds become ideal places round which settlements were situated.[4]

Ullman and Dacey suggests that large centres have a far greater range of services and functions than smaller ones. Relationship between

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1. Ahmad , A. , ' *Human Geography of the Indian Desert*, Phd Thesis , Aligarh Muslim University (1962), p. 226.
2. Dacey, M.F., ' An Analysis of Central Places and Point Pattern by a N.N. D. Method, Lund Studies in Geography Series, *Human Geography*, Vol. 24, 1962, pp. 55-75.
3. Chisholm, M., *Rural settlement and Land Use*, London 1962, p. 14.
4. Ahmad , A., *op. cit.* , p. 207.

size and functional range is curvilinear. With each new addition in population new functions are added.[1]

Kirk. H. Stone, (1965) defines settlement Geography as the description and analysis of the distribution of buildings by which people attach themselves to the land and calls for a focus of attention on where the buildings are they and why are they there.[2]

Jones (1965) states that the pattern of settlement is determined on the basis of the location of houses and the highways. This shows the shape of a settlement. Villages represent a sort of growth within the physical and cultural setting of a region. The pattern of settlement exhibits the relationship between one dwelling and the other. Sometimes is irrespective of site. Often the pattern is unrelated to site. The site may also have no bearing on pattern.[3]

Dube, (1965) pointed out that from times immemorial the village has been the basic unit in the organization of Indian social polity. Yet the Indian village community cannot be regarded as static. Time and the interplay of historical and socio logical factors have influenced the structure, organization and ethos of these communities in many significant ways.[4]

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1. Ullman and Dacey, ' *Locational Analysis' in Human Geography*, London (1965), p. 116.
2. Kirk. H. Stone, 'The Development of a Focus for the Geography of settlement ' *Economic Geography*, Vol. 41, October, 1965, pp. 346-355.
3. Jones , E. , Human Geography , London, (1965) , p.115.
4. Dube, S. C , Indian Village, London (1965) , p. 1.

Haggett Peter[1], (1965) found that time is an important factor in determining the locations of settlements. With the lapse of time development have been taking place according to a variety of reasons, social, political and economic which have a direct bearing on human beings settlements.

Jones, (1965) observes that the location of a village is the expression of a combination of physical and cultural factors operating in the area concerned.[2]

. Jordan, (1966) modifies the definition of settlement morphology (synonymous with "form of the cultural landscape") and adds that "description of the form should come before explanation". He defines settlement morphology in terms of vertical and horizontal dimensions as well as materials of composition.[3]

Perpillou, (1966) says that water supply is one of the most important and paramount factors in determining the location of rural settlements. Water being most necessary to men, animals and corps, man settles where it is available easily and in large quantities.[4]

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1. Haggett, P., "*Locational Analysis in Human Geography*", London, 1965, pp. 87-88.
2 .Jones, E. , *op. cit.* , p. 115.
3 . Jordan, T.G., "On the Future of settlement Geography", *Professional Geographer* , Vol. 18, 1966, pp. 26-25.
4 Perpillou , A. V. , *Human Geography* , London 1966, p. 406.

Jan and John, (1967) found that settlement pattern denotes the shape or arrangement of settlement in relation to natural or man made features or designs such as streams, ridges, canals and roads.[1]

Doxiadis, (1969) has given a theoretical framework for the formation of settlements. In this regard he sets forth five principles. The first principle is the maximization of man's Potential contacts with the natural elements (water, trees). The second principle is the maximization of the efforts required for the achievement of man's actual and potential contacts. The third principle is the optimization of man's potential space at even movement individually or in a group. The fourth principle is the optimization of the quality of man's relationship with his environment consisting of nature, society, shells & networks. The fifth principle is man's organization of his settlements in an attempt to achieve an optimum synthesis of the previous four principles.[2]

Hudson (1969) makes a study of the arrangement of dwellings in worth eastern Georgia and some rural areas of the United States. It is clear that ideas of individual members of a family and other attitude, towards ideal locations have a direct bearing on the arrangement of dwellings.[3]

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1. Jan, O. M. Brock and John, W. Webb, *Geography of Mankind*, New York, 1967, p. 242.
2. Doxiadis, C.A., "The Future of Human settlements " in *the place of value in world of Facts,* Eds. Tiselius, A. and S. Nilsson, Stockholm , 1969, pp.307, 338.
3. Hudson, J.C., " A Location Theory for Rural settlements" *Annals Association of American Geographer,* Vol. 59, 1969, pp. 365-381.

Mukherji (1970) has studied the cultural geography of Jats and has succeeded in tracing stages of Jats migration with emphasis on the origin, settlement pattern and nomenclature of their villages.[1]

Singh (1971) has presented hypothesis new regarding settlement pattern. According to him religions ritual norms of the Hindu Society lead to the maximization of Socio-Spatial distance among the different caste groups.While the secular norms of behaviour, which are based on functional expediency, lead ton the minimization of these distances.[2]

Tiwari (1972) mixes rural settlement Geography describing how the settlements are influenced by the rural landscape as well as by relationship as regard other aspects of rural life such as religion, rituals and social structures, economic functions as well as demographic characterstics.[3]

Nitz (1972) makes stimulating effort at evolving an outline and formulating a methodology for studying the evolution of rural settlement regions, using a comparative approach and making use of written records, archeological evidence, place names and field patterns. Nitz also pleads for the use of genealogical trees of rural families for reconstructing settlement processes and evolution of field patterns. The further suggests that

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1 . Mukerji, A. B., The Migration of Jats, A Study in Historical Geography, *The Indian Geographer*, Vol. 6, 1970, pp. 19-26.

2 . Singh, K. N., " An Approach to the Study of Morphology of the Indian village", *Rural settlement in Monsoon Asia*, ed. Singh, R. L., N.G. S. I., Varanasi, 1971, pp.203-214.

3 . Tiwari , R. C. , " A critique of Research Methodology of Rural settlements in India " *National Geographer* ,Vol. 7, (1972), pp. 69-79.

settlement genesis can be worked out by dating the periods with the help of place names.[1]

Sharma (1972) says that houses and house types reflect with great exactitude the inter-relationship between man and his environment and tell about man's struggle for shelter through time and space. The study of house types is necessary as well as fascinating. The house is man's first step towards his adjustment to his environment. The house is man's first step towards his adjustment ho his environment. The site of a house has a direct bearing on man's occupation. Water is most necessary to man, animals and crops. Man takes shelter where it is available easily and in large quantities. Religion is another major factor underlying the form, spatial arrangements and orientation of house.[2]

Nitz (1972) asserts that a kind of historical spatial settlement stratigraphy has been developed by name change anslysis and this technique should be applied routinely in much settlement investigation.[3]

Sharma (1972) has attempted intervening distance analysis in an Indian desert on the basis of the formula given below.[4]

$$2\left(\text{Cos}-30^{\circ}\right)1/2 \text{x}\left(\frac{\text{Area}}{\text{No. of villages and towns}}\right)^{1/2}$$

1 . Nitz, H. , ' Objectives and Methods of Geographical Research in the Evolution of Rural settlement Regions , *National Geographer*, Vol. 7, 1972, pp. 1-12.
2 . Sharma , R.C., " *Settlement Geography of the Indian Desert* ", New Delhi, 1972, p. 157.
3 . Nitz, *op. cit.* , pp. 1-2.
4 . Sharma , R. C . , *op. cit.* , p. 124.

$$= \frac{\text{Log}^2}{2} - \frac{\text{Log}^3}{3} + \frac{\text{Logareality}}{2}$$

$$= 0.0312347(\text{aconstant}) + \frac{\text{Logareality}}{2}$$

Sharma in a further study says that roads play important role in the location of anew settlement and also in the location of a new settlement and also in increasing the importance and size of a pre-existing settlement. In many cases recently, with the introduction of regular bus transport, road have acted as a factor promoting the growth of twin village type settlements.[1]

Bhala (1973) studies the patterns of settlement and it led him to identify topography and social group as interacting determinates.[2]

Brook and Webb (1973) have found that aggregation of population and the growth of village have been closely favoured by conducive factors like agriculture, water supply and mutual, social and economic needs. Density of a settlement results mainly from the degree or intensity of land use. Besides according to them, close social relationships and warm neighbourly feelings of the village community and cooperative agricultural

1 . *ibid* , p. 104
2 . Bhala , R. L. , " Rural settlement Pattern in Rajasthan Desert" , *Ajmer Geographer*, Vol. 5 , 1973, pp. 51-59.

practices have strengthened the traditional cohesive character of the settlements in the Ganga Yamuna Doab.[1]

Singh (1973) has identified compact, semi-compact and hamlet types of rural settlements, and correlates the types on the basis of the well known physiographic and cultural facors.[2]

Mukerji, (1974) says that rural settlement studies have for a long time shown a greater concern for types and patterns than for other attributes. He has given another attribute- spacing of rural settlements. With the help of a formula spacing may be easily calculated.

$$S = 2x\left(A/Nx\right)^{1/2}$$

S represents spacing, A represents the area of study and N is the number of rural settlement. Finally he has drawn the conclusion that there is a positive correlation between low productivity, low density of rural population, small villages and wider spacing.[3]

Mann (1974) describes the structure of rural settlement by applying the means of settling processes with reference to the role of socio-historical forces in their formation and function. [4]

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1. Brook , Jan, O. M. and John W. Webb, A Geography of Mankind, New York, 1973, p. 358.
2. Singh, S.B., "Types and Pattern of Rural Settlements", A Case Study of Sultanpur District, India, *The Geographical View point*, 1973, Vol. 4, No. 182, pp. 17-27.
3. Mukerji, A.B., "Spacing of villages in Upper Ganga Yamuna Doab", *Geographical Review of India*, Vol. 36, No.2, 1974, p.65.
4. Mann, R.S., "Meaning, Aim and Future of Rural Settlement Geography", *Indian Geographical Journal*, Vol. 49, No.2, 1974, pp. 53-62.

Mann (1974) also examines attributes other than morphology to know the spatial variation in the size of settlements. According to him, there are three parameters – population size, areal size and number of occupied house independently of spacing. Need for defence, cultivated area and transportation network are also related to the population size of the settlements.[1]

Mukerji (1974) stresses that the site, situation and location are important attributes of rural settlements, playing their role in morphological evolution as well as in socio-spatial structures.[2]

Sen (1974) observes that site, situation and location are no doubt important attributes of the rural settlements. For example, people change their site in response to flood hazards. He also provided a fruitful guideline for studying the factors involved in the decision-making processes of a community for maximizing the futility of a site not merely in terms of morpholcgy but also of function.[3]

Singh, R.L and Singh, R.B. (1975) have studies the morphogenesis of an Indian village with a Rajput clan settlement in Middle Ganga Valley.[4]

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1 . Mann, R.S., Rural Settlement Size in Hangi Tehsil (Haryana), *Deccan Geographer*, Vol .12, Jan-June, No. 1, 1974, pp.27-28.

2 . Mukerji, A.B., Morphologenetic Analysis of Rural Settlements of the Chandigarh Siwalik Hill, *Punjab University Research Bulletin (Arts)*, Vol. 5, No.2, 1974, pp. 58-93.

3 . Sen, J., "Change of village site", *Geographical Review of India*, Vol. 36, No. 3, 1974, pp.273-76.

4 . Singh, R.L and Singh, R.B., "Spatial Diffusion of Rajput Clan Settlements in a Part of Middle Ganga Valley", *Rural Settlement in Monsoon Asia*, ed. Singh, R.L., Varanasi National Geographical Society of India, (1975), pp. 152-170.

Bhattacharya (1975) correlates the settlement patterns of Deltaic West Bengal with physiography and agricultural land use. He has also worked out a convincing correlation of settlement pattern with micro-topographic variation. He asserts that deltaic settlements of the Middle Ganga Valley are not applicable to deltaic regions.[1]

Singh, Rana (1975) suggests that varying degrees of regional and local dominance and sub dominance in any sphere, either caste, numerical, economical, educational, cultural or political, influence the settlement pattern.[2]

Edwards (1975) has studied Iberian settlement activities in America through questionnaires called Pelaciones Geographicas and in the ordenanzas de publaciones of the codingo de India's.[3]

Hassan (1975) focuses his attention on functional analysis and has found that settlements generally present a good example of human adjustment to the geographical environment. So that fauna, flora, terrain, water bodies and climate, all have their impact on human culture.[4]

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1. Bhattacharya, R., " Settlement Pattern in Deltaic West Bengal, *Geographical Review of India*, Vol.37, No. 4, Dec. (1975), pp. 303-10.
2. Singh, Rana, P.B., "Distribution of Castes and Sewich for a New Theory of Caste Ranking Case of the Saran Plain", *National Geographical Journal of India*, Vol. 21-1, (1975), pp. 27-28.
3. Edwards, C.R., "The Relaciones de Yucatan as Sources for Historical Geography", *Journal of Historical Geography*, Vol. 1, No. 3, (1975), pp. 245-258.
4. Hassan, S., " Regional Variation in the House Types in Kumaun", The Geographer, Vol. 22 , No. 1, 1975, p. 56.

Singh, R.L. and Singh, R.B (1978) have found that old settlements are associated with physical features like rivers, because the earliest settlers followed the main watercourses and their tributaries upstream. Such findings appear valid in many pioneer zones of the world and even for landscapes, which have been quite altered with the passage of time.[1]

Hassan (1980) says that geopolitical and national ideology have guided both pre-1948 and the post-1967 Jewish frontier settlements in Israel. According to him, each settlement stage was characterized by penetration into remote areas on the periphery of older established communities. In order to comprehend the development of Jewish frontier settlements three factors must be taken into account the historical geographic situation, the method of settlement and the spatial network of the settlements themselves.[2]

Berensten (1982) says that settlement pattern in the Federal Republic of Germany has undergone changes along democratic lines since 1945 due to the new policy of the Government. Greater impetus has been given to the rural areas and this has led to the stability of small rural

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1 . Singh, R.L.and Singh, R.B., "Spatial diffusion of Rajput Clan Settlements in a part of Middle Ganga Valley", In Rural Settlement in Monsoon Asia, Ed. Singh, R. L., Varansi, 1972, pp. 151-170.

2 . Hassan, S., "Israel, Frontier Settlements a Cross; Temporal Analysis ", *Geoforum*, Vol. II, No.4, pp. 227-235.

centres at the expenses of larger urban centers, which has brought about changes in both urban and rural areas, affecting the pattern of settlements.[1]

Johannes Auget (1982) asserts that the politico-economic factors must be taken into consideration regarding the condition of rural settlements.[2]

Singh (1983) have studied the hierarchical systems and spatial patterns of central places in Baghpat tehsil on the basis of population size, central functioning and amenities available among rural settlements in the tehsil and the district.[3]

Nag (1984) have studied the evolution of Zambian settlements and planning in order to develop continuum of settlements, check rural urban migration, discourage squatter settlements, organize the country through settlements and highlight the possible trend for future settlements[4].

Grover (1985) discusses the evolution of the Kanet landscape by selecting a sample village Behlon in the Morni Hill of Siwalik range in the state of Haryana. It is believed that Kanets belong to the Rajput caste having a distinct identity to their own. The Kanet settlement may be located

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1. William H. Berensten, "Changing Settlements Pattern in the German Republic", (1945-76), *Geoforum*, Vol. 13, No. 4, (1982), pp. 327-337.
2. Johannes Auget, Human settlement Problems in Brazilian Development, *Ekistics*, Vol. 49, No.292, Jan-Feb. (1982).
3. Singh, O. N., "Hierarchical Systems and Spatial Patterns of Central Places in Baghpat Tehsil, Meerut, *National Geographer*, Vol. 18, No. 2, 1983, pp. 245-55.
4. Nag, P.," Geography of the Zambian Settlement", *Philippine Geographical Journal*, Vol. XXVIII, No. 3 & 4, 1984, pp. 110-17.

as a caste territory on a Kanet culture area since they are both numerically and in terms of lands ownership dominate.[1]

. Doxiadis's definition was given a new shape later in 1987 by Alexander B. Leman, who proposed a second definition, "human settlements are spatial / operational arrangements made by humans within certain scales, in order to support life and to pursue their aspirations, goals and targets.[2]

Nag (1990) has discussed interesting findings of Zambian settlements. He has studied spatial analysis and growth of population, rural development, urban settlements and urbanization, housing and squatter settlements in detail supported by suitable quantitative settlement analysis.[3]

Gill, M.S (1991) observed that centuries old compact village in Punjab are gradually moving toward dispersion because of some factors like the enhanced feeling of security, rapid economic growth, acceleration in the rate of population growth, rapid rise in aspiration levels especially among the younger and educated ruralites and lastly gradual spread of urbanisim.[4]

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1. Grover, N., "Kanet Settlement of Siwalik Hills in Haryana: A Study of Fieldscape", *The Indian Geographical Journal*, Vol. LX, No. 1, 1985, pp. 37-42
2. Leman, Alexander B., "Human Settlements: The Second Definition", *Ekistics*, Vol. 325, (1990), pp. 243-248.
3. Nag, P., "*Population, Settlement and Development in Zambia*", Concept Publishing company, New Delhi, 1990.
4. Gill, M. S., " Changing Rural Settlements of Punjab", *The Indian Geographical Journal*, Vol. 66, No. 1, 1991.

Singh (1996) has identified the rural settlement of Saryupar plain as compact, semi-compact, hamleted and dispersed settlements on the basis of various physico-cultural and socio economic factors.[1]

The analysis of evolution of rural settlements and their spatial variation in an ancient settled region like the Meerut District is a difficult task, due to the complexity of successions, absorptions and interruptions by later settlers on the one hand, and lack of adequate data and records on the other. However, an attempt has been made in the present work to trace the evolution of rural settlements and their spatial variations in the Meerut District, with the help of the available sources and field studies.

The beginning of the rural settlements in the region goes back to the late Harappan period. Archaeological excavations at various sites of the District have revealed that the settlements of this region had begun around 1800 B.C. The earliest remains i.e., pottery belonging to the late Harappan period have been found at Alamgirpur. Then, successive cultural remains of different periods have also been recovered from different places in the region. Before the arrival of Aryans, Harappan culture was prevailed there. Harappan people were known as first settlers. There is at present, no indication from which direction the first settlers came. It is possible that they moved in from the hills and forests to the south of the Ganges, but the

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1. Singh, S. B.and N. Singh,"Spatial Analysis of Rural Settlements in a Part of India", *National Geographical Journal of India*, Vol.42,Part 1&2,Mar.& Jun.,1996, pp.62-70.

more likely direction seems to have from west, in which event they would have moved eastwards down the river valleys. The Ganga valley seems to have been home of the Proto-Indics or Proto-Australoids and the Munda language. In early Sanskrit texts the inhabitants have been described as Nisadas, Bharatas and Savaras. The memory and traditions of these ancient people, particularly their later descendants, the Bhars, Soeris and Cherus are still presented in the region The culture of the Harappans was succeeded by that of the semi-nomadic and pastoral Aryans who spoke Sanskrit and worshipped a group of gods led by India. The Aryan colonists from their first settlements in the Punjab gradually migrated southeast and eastwards down the Ganga valley. They gave up their nomadic habits and set up permanent settlements along the tributaries of big rivers. The dwellings in their settlements were made of wood and bamboo and they do not differ much from those found in the study area even today. The Aryan migration started in the region in the 9th BC, and had been completed by the end of the 7th BC. The region was at first affected by the migration waves of Rajput clans at the beginning of the twelfth century AD and migration of various corporate groups or clans on a much larger scale followed the Muslim invasion in 1192, when Qutb-ud-din Aibak captured the fortress of Meerut. Since, a wave of migration continued up to 18th century, each of which has left its imprints upon the study area, a distinct socio-economic and cultural those has emerged in it. It is rather difficult to trace

the patterns of ancient and medieval settlements until extensive excavations have been conducted, which is impossible on account of the high density of population in the region. So the existing rural settlements have been taken into consideration for spatial analysis.

It is observed that, throughout the human history the settlements have evolved in relation to topography and resources of the area. The majority of the people of the region live in villages. This is a clear indication of agricultural development and stability on the fertile Upper Ganga Yamuna Doab. Initially people lived in scattered hamlets, and later they clustered together in favourable spots either along the water courses or highways, which gave rise to the compact village type.Several historical and physico-cultural factors such as better means of transport and communication, efficient irrigation facilities and improvement of socio-economic conditions of the people together with the increase of population have been the main causes of the clustering of human habitats in many parts of the study area. In contrast to the compact type, there is the scattered type of rural settlement occurring in infertile tracts, usar infested areas, and areas with poor irrigation and transport facilities in the District. So the existing rural settlements have been taken into consideration for spatial analysis.

The rural settlements of the District do not appear to have been formed on a planned basis, but to have just grown. Some of the settlements are still found surrounded by walls, which indicates that they were established at a time when settlers needed protection from outside attack. Moreover, in most cases the shape of the village is roughly rectangular. Other geometrical shapes, such as square, semi circular and elongated are also found in some areas. A detailed description of the shapes of villages along with the layout of the village roads is to be found in a treatise on village plans, called "Mansara Shilpastra", believed to have been compiled in the fifth century B.C. It is therefore, very likely that some of the settlements conformed to the traditional village plans, indicating thereby that there has been a continuity in the growth of settlements from the Aryan period to the present time through ancient, medieval and modern periods in India in general and in the study area in particular. This is also corroborated by the fact that the villages of Buddhist time, like of those today, were compact and self sufficient and extended in the linear form along the principal waterways, with the decline of Buddhism and disappearance of rural republics by the end of 5th century AD, the compactness of village was broken and settlements got scattered into hamlets. During the medieval period, villages remained practically unchanged as the Muslim preferred to live in towns rather than in the countryside. With the establishment of the British rule, the village type

remained almost the same although the need for living within the village was no longer felt by the people due to the restoration of peace and security in the region. The surplus rural population came out of the village ramparts and established hamlets in the neighborhood of their fields.

The study area, Meerut District, one of the early settled regions of the country involves interesting patterns of human congregation for which it has been purposively selected for making a humble contribution to the growing field of Rural Settlement Geography. The District lies in the fertile Ganga Yamuna Doab. The District has an agrarian base and presents diverse physico-cultural and socio-economic conditions at micro-level in its different parts. It is one of the most ancient settled regions and has a long history of peopling and occupancy. Several archaeological findings, historical records and local legends pertaining to the pre-historic time, show that the study area was initially occupied by Bhils , Nagas, Khandus and other aborigines. Inspite of the intermixing of various ethnic groups and cultural traits from within and outside the study area has preserved its own traditions, culture, myths and related norms and values, which has resulted in shaping the uniqueness in its identity. It may be added that no serious study on the evolution and spatial variations of rural settlements has been made so far in the District.

Objectives

The objective of the present study is an analysis of the various aspects of the evolution of rural settlements and their spatial variations in the Meerut District. So as a first step, an understanding of certain basic issues becomes inevitable.

1. To study the physical, cultural and demographic parameters that give rise to variations in the meso and micro regions of the study area, as base for human settlements.
2. To trace the evolution of rural settlements from prehistoric times to modern period with the help of cultural ecology and place names analysis, and also to examine the territorial evolution of different clans in the study area between 1556 and 1874 A.D.
3. To deal with some salient characteristics of a few models of spatial diffusion, discuss the five-phase sequence of settlement diffusion of the Meerut District.
4. To interpret the distributional pattern and the inter-relationship among the rural settlements with the help of size (population and area), spacing (observed, expected and index of randomness) and other characteristics, through these findings an attempt has been made to measure the degree of concentration and dispersion and to classify the rural settlements in different types.

5. To study the factors that are responsible for the formation of different types of rural settlements in the study area.

6. To deal with the traditional view of shape analysis as well as the geometrical form of shapes, and to study the factors responsible for the formation of various patterns of rural settlements in the study area.

7. To identify rural house types on the basis of their building materials and sizes and to suggest suitable house plans for the District.

8. To analyse the social morphology of the selected villages (built-up areas) based on the religio-ritual and secular dominance models, and also to examine the influence of castes and dominant landownership on the spatial patterning of rural house in the study area.

9. Finally, to summarise all the observations made during the course of study and the net results thereof.

Methodology

In order to analyse the evolution of rural settlements and their spatial variations in Meerut District there are so many sources which are extremely helpful in providing significant clues to the understanding of the evolution of settlement patterns in the District e.g., archaeological findings, historical

sources, various written records, place names, culture, cults, folklore, maps, field surveys and interviews.

Archaeological findings comprises earliest remains i.e, pieces of ochre coloured pottery (OCP), black and red ware (BRW), painted grey ware (PGW), classical Northern Black Polished ware (NBPW) and Medieval glazed ware (MGW). A large number of terracotta male and female figurines, plaques, sculptural pieces, corroded coins, burnt bricks, fragmentary inscriptions on stones, statuettes, ruined brick stupas etc. have been found all over the study area. These evidences shed light on the sway of different dynasties from prehistoric period as well as ancient and medieval period. The antiquities recovered from the study area are well preserved in various museums under the supervision of Survey of India.

Written records include Ain-i-Akbari by Abul Fazl, Miscellaneous papers of revenue settlement, Institute Gazette, District Gazetteers, Gazetteers of North Western Provinces of Agra and Oudh, Memoirs North Western Provinces of India, Memoirs Statistical, Descriptive and Historical Account, Meerut and a large numbers of books on regional and local history. These are preserved in the state archives, revenue records rooms of the district and tehsil headquarters and libraries.

Culture, cults, folklore, legends, and oral history as narrated by the people, interviews and field surveys have been used to trace the place names of the villages.

To examine the spatial distribution and types of settlements in terms of spacing, degree of dispersion and concentration, quantitative techniques have been used in the following manner.

i) $$D = 1.0746\sqrt{\frac{A}{N}}$$

ii) $$R_N = \frac{r_o}{r_E}$$

For the identification of settlement types, village and hamlet ratio as well as inter village spacing, density of village per 100sq. km. In relation to theoretical spacing together with survey of India Topographical sheets supplemented with field observations have been taken into consideration.

For the analysis of the pattern or shape of settlements both qualitative (classical), and quantitative (modern) approaches have been applied. Shapes of settlements have been measured taking 10% of villages as a sample on random basis, using the following formula.

$$S = \frac{\dot{A}}{\pi R^2}$$

The shape analysis of settlements has also been made by taking into account the number of contacts between a village and its neighbouring villages. Dirichlet / Thiessen Polygons and Hexagons have been used for proper planning of rural settlements.

The composition of building materials has been taken into consideration for the classification of rural houses. Social morphology or spatial patterning of built-up areas of selected villages of different types belonging to different tehsils of discrete ecological settings at micro-level has been analysed on the basis of religio-ritual and secular dominance models.

The study is primarily based on fieldwork and analysis of relevant topographical sheets as well as orally recorded history. Fieldwork has involved extensive traversing through the study area with the aim of observing the landscape features of the study area. Observation of the landscape includes a careful examination of the village landscape, its settlement morphology, house types, building materials used, ground plans, modes of house construction and religious symbolism attached it to (if any) and general living conditions of the people. Such detailed work on the core elements of rural settlements has, however been limited to two selected villages.

The survey of India topographical sheets of the District on the scales 1:50,000 have formed the basis for studying the distribution, types and patterns of rural settlements in the study area. Similarly for a morphological study of the sample villages cadastral maps (scale 16"=1 mile) have been used, while the nearest neighbour analysis is based on the tehsil maps

contained in the District Census Handbook (1991), duly corrected, all the maps being joined together to form the District map. Various Atlases such as the National Atlas, Uttar Pradesh in Maps, Census Atlas of U.P, and Atlas of Mughal Empire, have also been used for drawing the outlines of the District and for identifying the territories of the study area during the medieval period.

The collected data, both primary and secondary has been presented in tabular form and analysed, using different quantitative techniques to derive specific conclusions regarding dispersion, spacing, shape analysis and settlement types. Sample choropleth mapping has been adopted throughout the work. A plethora of tables has been avoided by cartographic representation. Community Development Blocks have been chosen as areal units for the analysis of rural settlements. Nearest neighbour distances for all the villages of the study area have also been measured.

Organisation of Chapters

The entire study is divided into following six chapters excluding introduction and conclusions.

The Introduction deals with the meaning, scope, various approaches of the rural settlements, a review of relevant literature and references, importance of the study, selection of the area, objectives, methodology and the organization of chapters.

The first chapter gives the brief introduction of the area, its physical, cultural and demographic setting with emphasis on physiography, geology, drainage, climate, soil and cultural attributes, e.g., land use, cropping pattern, irrigation, transport and communication, manufacturing activities and rural market centres. It also provided with the demographic structure and distribution of castes in the District.

The second chapter deals with the historical perspective concerning the evolution of rural settlements of different periods, taking into account the place name analysis, archaeological evidences, travel accounts of different people and historical legends. It also deals with the evolution of territorial units through land occupancy of various zamindars, clans or corporate political group between the sixteenth and the nineteenth century, who functioned as the dominant local power in different parts of the region and always occupied the best available sites of the territory and allowed other, non- corporate group of men and women to settle on lands given to them to carryout their socio-economic activities within its organizational framework.

In the third chapter an attempt has been made to study the spatial distribution of rural settlements. The distribution of rural settlements is affected by several factors in which the relief, distribution of resources, population, land under cultivation, types of agriculture, development of road network, localization of resources, political decisions and cultural bonds are

the important factors on the distribution of rural settlements in the Meerut District. The spatial pattern of rural settlements has been studied quantitatively by using quantitative techniques.

The chapter fourth examines the various patterns of rural settlements found in the study area in response to the physical and cultural factors. These patterns have been identified on the basis of the Survey of India topographical sheets and have been checked and modified with the help of village cadastral maps and through personal observation, wherever possible. Shape analysis of the villages has been based on quantitative techniques, taking into account 10% of sample villages on random basis. Further, relationship among contact index, population density and areal size of the villages has been studied. The present researcher has recommended that thiessan polygons and hexagons be adopted as model while planning the development of the villages in the study area.

Fifth chapter has been devoted to study the rural house types and building material. The Indian village bounded by agricultural land with different types of building materials and house types in the regional settings. Human dwellings are governed by tradition and cultural elements of the time and they form one of the most basic elements in the cultural landscape and hold a significant place in the geographical analysis of settlements. House is a symbol of regionalism representing social, cultural and economic

organisation of its people. In this chapter present researcher has attempted to find out the impact of various physical and cultural factors on the patterns of house and the type of building material used in the study area. Suitable rural house plan and a few remedial measures have been suggested for improving the village environment.

Chapter sixth seeks to analyse the social morphology of two selected villages (built-up area), based on the religio-ritual and secular dominance models. The influence of castes and dominant land-ownership on spatial patterning of rural houses of these two selected villages of the District have been examined through field observation.

Lastly the conclusions have been drawn and the recommendations have been made for the rational planning of rural habitat in the study area.

CHAPTER 1

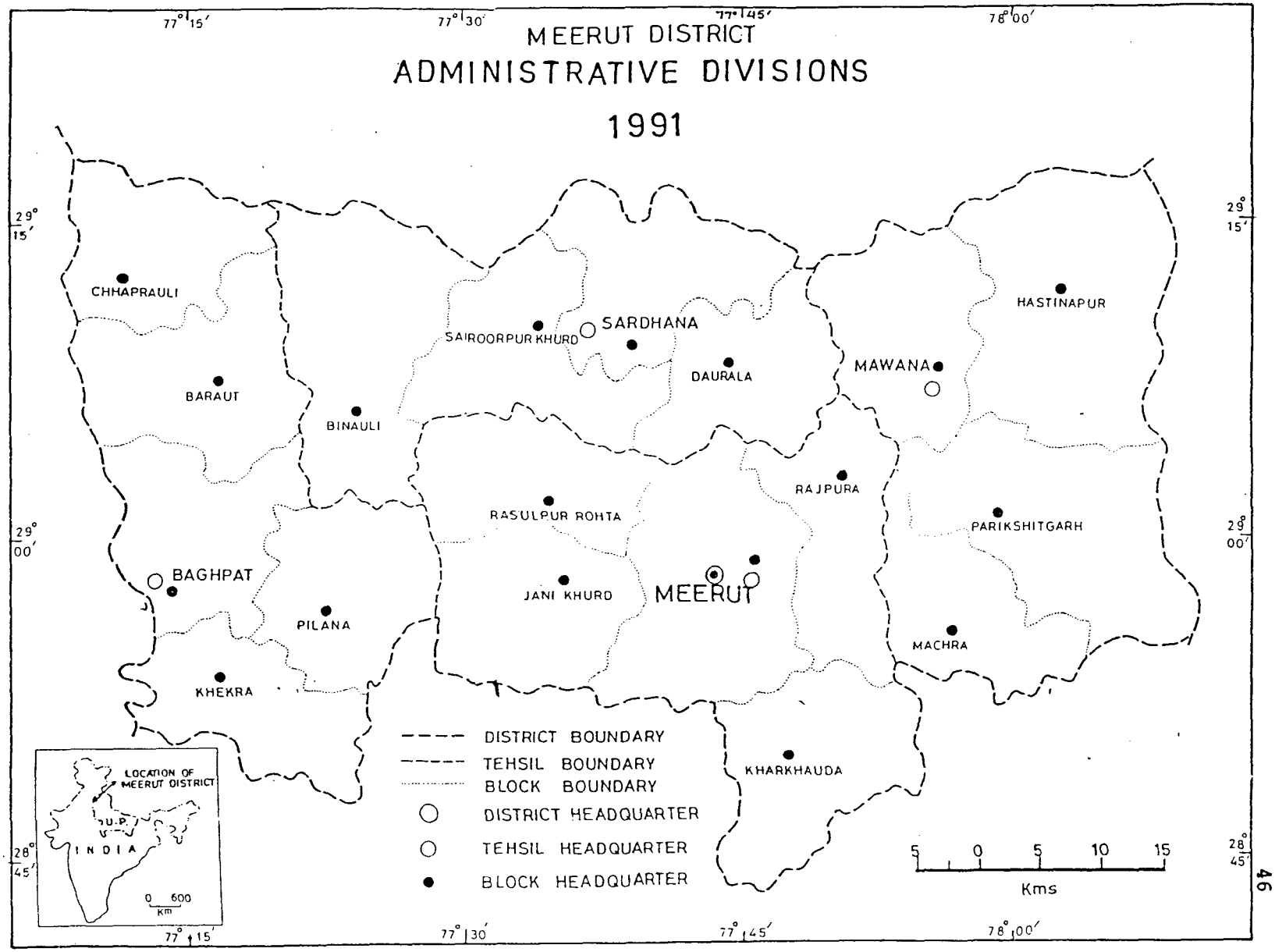
PHYSICAL, CULTURAL AND DEMOGRAPHIC SETTINGS

CHAPTER 1

PHYSICAL, CULTURAL AND DEMOGRAPHIC SETTING

It is necessary to make an assessments of the physical and cultural level of the region before going into details of rural landscape. This is the prerequisite for the analysis of human settlements in spatial temporal context. This is because the origin, growth, types and patterns of rural settlements and the location and site of central places have close connection with the physical landscape of the region and this in turn controls the environmental setting, economic resources and the cultural heritage of the people.

The Meerut District has some of the ancient human settlements in Uttar Pradesh. It is located in the western part of the state, at a distance of about 64 km from Delhi. It lies in the northern part of the Ganga Yamuna Doab. On the north it is bounded by the District of Muzaffarnagar, on the south by that of Ghaziabad and on the south-west by the Delhi. The Ganga forms its natural boundary on the east and separates it from the Districts of Bijnor and Moradabad. Most of its western boundary is marked by the Yamuna which separates the District from the Haryana state (Fig.1.1). The Meerut District extends from 28°32' to 29°18' north latitudes and 76° 7' to 77° 8' east longitudes. The greatest width from east to west is about 93 kilometres and the maximum stretch from north to south is about 77


MEERUT DISTRICT
ADMINISTRATIVE DIVISIONS
1991
77° 15′
77° 30′
77° 45′
78° 00′
29° 15′
29° 00′
28° 45′
CHHAPRAULI
BARAUT
BINAULI
SAIROORPUR KHURD
SARDHANA
DAURALA
MAWANA
HASTINAPUR
RAJPURA
RASULPUR ROHTA
PARIKSHITGARH
BAGHPAT
JANI KHURD
MEERUT
PILANA
MACHRA
KHEKRA
KHARKHAUDA
DISTRICT BOUNDARY
TEHSIL BOUNDARY
BLOCK BOUNDARY
DISTRICT HEADQUARTER
TEHSIL HEADQUARTER
BLOCK HEADQUARTER
5 0 5 10 15
Kms
LOCATION OF MEERUT DISTRICT
U.P.
INDIA
0 600
Km

FIG·1·1

kilometres. The District, according to 1991 census, has a population of 3447912, spread over an area of 3911 square kilometres. The density of population is about 881 persons per square kilometres. About 2171355 people live in rural areas while the urban population is 1276557. The District has been divided into four tehsils, namely Baghpat, Sardhana, Mawana and Meerut. These tehsils are further divided into eighteen blocks Chhaprauli, Baraut, Baghpat, Pilana, Khekra, Binauli, Saroorpur Khurd, Sardhana, Daurala, Mawana Kalan, Hastinapur, Parikshitgarh, Machra, Rasulpur Rohta, Jani Khurd, Meerut, Rajpura and Kharkhauda. Table 1.1 shows areas of the blocks and the number of inhabited and uninhabited villages in each of them.

1. PHYSICAL SETTING

The Meerut District is a vast alluvial plain with a slight slope from north to south or southeast. The whole District is almost a level plain and is remarkably homogenous in character. The average gradient is about 0.6096 metres in the 1.5 kilometres and is and almost uniform throughout the district. The whole of the District is a well cultivated plain and there is no uneven ground except in the area of the ravines near the river valleys and the scattered *bhur* ridges in the upland tract. The main features that affect the plain are the rivers whose valleys are of varying width and are on a lower level than the main upland tract. The flood plains of these rivers are small but the transition from the river valleys to the upland is marked by ravines and erosion or by sloping sandy undulations.

Table 1.1

Meerut District: Administrative Unit 1991

S.No.	Blocks	Geographical Area (Sq. Km.)	Revenue Villages		
			Inhabited villages	Uninhabited villages	Total No. of villages
1	Chhaprauli	182.0	27	4	31
2	Baraut	235.8	54	2	56
3	Baghpat	187.0	51	4	55
4	Pilana	203.6	50	7	57
5	Khekra	162.7	46	6	52
6	Binauli	297.9	59	4	63
7	Saroorpur Khurd	204.4	34	2	36
8	Sardhana	186.3	47	1	48
9	Daurala	189.2	51	4	55
10	Mawana Kalan	221.6	57	4	61
11	Hastinapur	349.4	86	24	110
12	Parikshitgarh	318.7	72	10	82
13	Machra	185.6	48	4	52
14	Rasulpur Rohta	154.5	45	4	49
15	Jani Khurd	175.6	56	2	58
16	Meerut	72.1	25	2	27
17	Rajpura	163.9	49	1	50
18	Kharkhauda	1974	43	5	48
Total Rural Area		3687.8	900	90	990

Total Urban Area 223.2

Total Area of the District 3911.0 900 90 990

Source: Statistical Magazine: Meerut, Meerut Institute of State Planning UP, 1992-93, p. 27.

1.1 Major Physical Divisions

Broadly speaking the District can be divided into four physical divisions, the Yamuna Hindan doab, the central depression, the eastern uplands and the Ganga *khadar*.

i. **The Yamuna Hindan Doab**: The tract lies between the Yamuna on the west and the Hindan on the east that includes the whole of the tehsil Baghpat and portions of tehsil Sardhana. From a width of over 25 kilometres in the north it narrows down to about a third in the south, where these two rivers tend to converge. The tract in general is the most fertile portion of the District consisting of rich and almost uniformly loamy soil and is flanked by belts of poor soil and broken relief associated with the rivers, the quality of soils, varying slightly from north to south. The tract is bounded by the Hindan on the east and by a high ridge on the west, the soil of which is of a poor quality, the terrain being generally broken up by small ravines. There are a number of *bhur* mounds along the banks of the rivers, the Krishni and the Banganga.

ii. **The Central Depression:** This tract, lying roughly between the Hindan and the Muzaffarnagar-Meerut-Bulandshahr road, includes the western parts of the tehsils of Sardhana and Meerut.

The soil of the strip between the Hindan and the Ganga canal is of excellent quality except for the usual poor sandy soil along the Hindan. East

of the Ganga canal, the slope of the land as far as the centre of this tract is towards the east but from there onwards there is a rise as far the Muzaffarnagar-Meerut-Bulandshahr road, the depression beginning near Sardhana and extending as far south as the Bulandshahr border and being naturally inadequately drained.

iii. **The Eastern Uplands:** This tract comprises the area between the central depression and the ravines of the Ganga and includes the major portions of the tehsils of Mawana and parts of the tehsils of Meerut and Sardhana. It is drained by the Kali Nadi and its affluent, one of its important features being the existence of a series of sandy *bhur* strips. The entire eastern portion is broken up by the Ganga and in the west, pargana Sarawa is very poor in fertility on account of the presence of sand.

iv. **The Ganga Khadar:** The easternmost tract is the low *khadar* or flood plain of the Ganga. This tract is characterized by the existence of several depressions and watercourses generally connected with the river. It is bordered on the west by the old high riverbank and this particular area is covered with ravines. Some parts of the *khadar* are capable of cultivation but the soils are generally light and poor and the tract is mostly covered with tall grass which gives shelter to wild animals. The alluvial area in the *khadar* mainly consists of a string of villages bordering the main stream. Fig. 1.2 shows the physiographic division of the District.

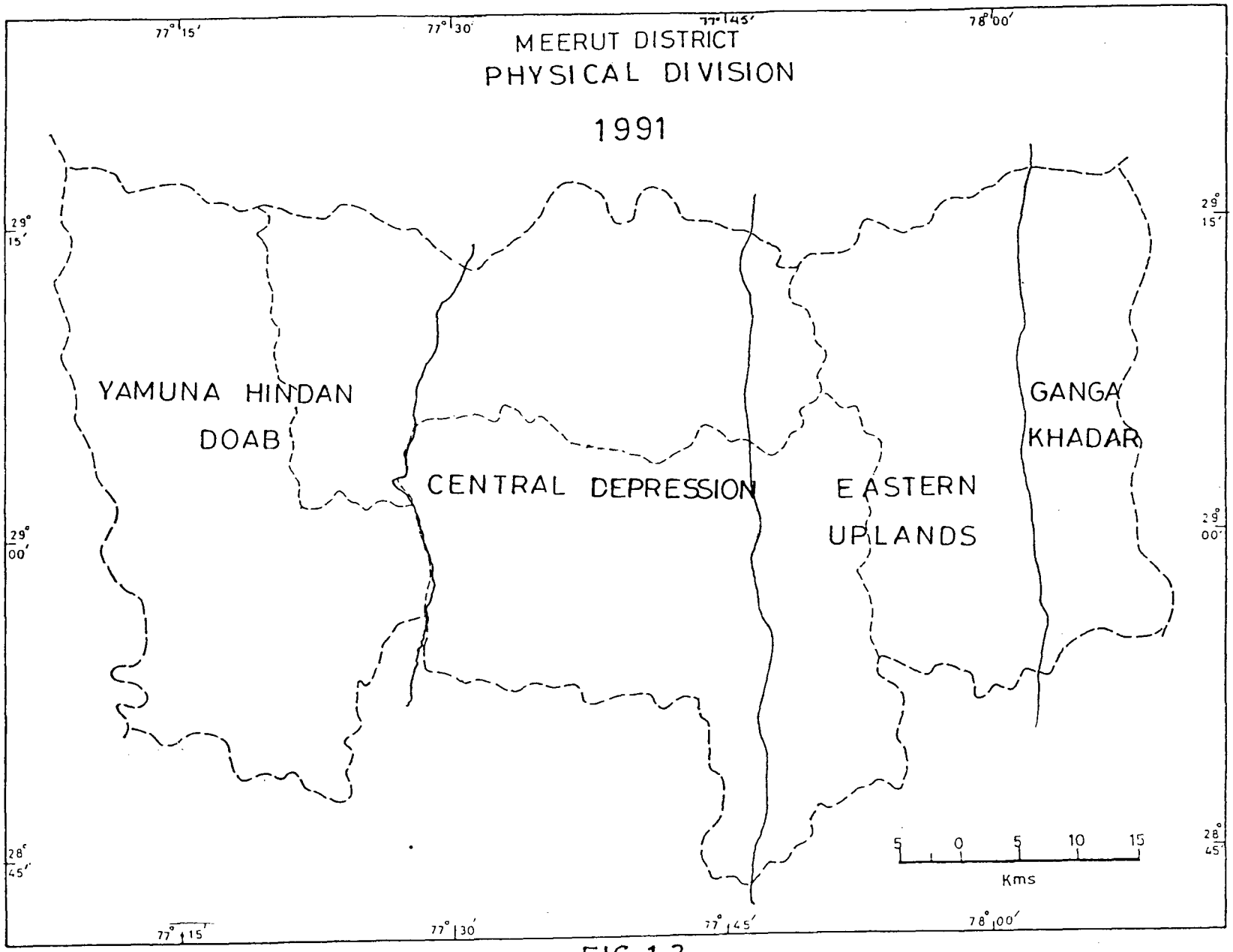

MEERUT DISTRICT
PHYSICAL DIVISION
1991
77° 15'
77° 30'
77° 45'
78° 00'
29° 15'
29° 00'
28° 45'
YAMUNA HINDAN DOAB
CENTRAL DEPRESSION
EASTERN UPLANDS
GANGA KHADAR
5 0 5 10 15
Kms

FIG. 1·2

1.2 Structure and Relief

The Meerut District forms part of the Ganga Plain, the origin of which has been a subject matter of controversy and conjecture. This Great Plain is a vast area of alluvial deposits extending over about 2400 kilometres from east to west and 400 kilometres from north to south. The alluvial plain occupies the synclinal basin between the Himalayas in the north and the Deccan Plateau in the south and is composed of the sediments deposited by the Himalayan rivers.

Various hypotheses have been put forward to explain the origin of this Great Plain. Edward Suess is of the view that the synclinal basin was a 'fore deep' formed in front of the resistant archaic land mass of the peninsula during southward compression of Tethyan sediments against the rigid peninsular block under the huge thrust of the southward moving block of general Asia.[1]

Burrard attributes the origin of the depression to parallel faults with a downthrow of about 32 kilometres. Burrard's view has, however, not gained much favour as it is criticized to be based on geodetic observations and is not supported by geological investigations and findings.[2]

Wadia and Auden believe that Great Plain was formed as a result of gradual subsidence of Archaean gneiss which took place to counter balance

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1. Suess, E., *The Earth*, Vol. IV, P. 619 and Krishnan, M.S., *Geology of India and Burma*, 1956, P.57.
2. Burrad, S.G., The origin of Himalayan Mountains Geological Survey of India, Professional Paper No.12, 1912, p.11 and Wadia , D. N. and J.B. Auden, Geology and Structure of North India, *Memoirs of the Geological Survey of India*, Vol. 73, 1939, P.134.

the uplift of the Himalayas and the consequent loosing of the adjoining belt of heavy and continued sedimentation. The process of sedimentation and sinking continued with increasing vigour during the Himalayan orogenesis and ultimately the alluvial plain came into being. This view is mainly based on the evidence of the presence of the characteristics Gondwana rocks on the northern rim of the alluvial belt.[1]

The geological history of the plain dates back probably to the Upper-Eocene period when it began to develop in the form of a depression. By the Middle-Miocene the depression fully developed and since then it has been filled by sediments brought down mainly by the Himalayan rivers and ultimately it assumed the form of a vast alluvial plain with a very gentle slope towards south and east.

Geologists differ in their estimate of the thickness of the alluvial deposits in the area. On the basis of geodetic observations, Glennie has estimated its thickness to be about 1950 metres.[2] Borings done mainly for artesian wells have penetrated only upto 1606 metres in the recent alluvial strata.[3] Magnetic surveys reveal local highs and lows, all of which dip

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1. Wadia, D.N., and J.B. Auden, Op. cit p. 128.
2. Glennnie, E.S., Gravity Anomalies in the Structure of the Earth's crust, *Mem. Geol. Survey of India*. Prof. Paper No. 27, Dehradun, (1932), p. 18.
3. Krishnam, M.S., *Geology of India and Burma*, New Delhi, (1982), p. 573.

steeply to the north. In 130 borings, the depth from the surface to the bedrock was found to range between 400 and 100 metres.[1]

Geologically the alluvial deposits may be divided into two sub-divisions: *bhangar and khadar*. The *bhangar* lands or the older deposits forming the greater part of the Ganga Plain and comprising the beds, which are undergoing denudation. The most important material in *bhangar* lands is clay, which, at places, becomes loam or sandy loam. In this clayey part of the alluvium, irregular *kankars* (nodules of calcium carbonate of various shapes and sizes) are found at different levels. These have been formed due to transformation of calcareous material of alluvial deposits into lumps or nodules.

The *khadar* lands or the newer deposits, mainly found in the deltaic region, comprising the tracts where the alluvial formation is still active. The newer deposits are also found in the immediate vicinity of river channels even in the areas where older deposits predominate. The low level of the *khadar* is in conformity with the principle that, as a river gets older, more and more of its deposits are found to be of a younger age, and as the bed of the river sinks lower, and so these younger deposits occupy lower levels than those occupied by the earlier deposits. *Khadar* lands are light coloured and poor in calcareous matter, and are composed chiefly of sand, silk, mud and clay. Their clay has less *kankars* and contains the remains of living species Fig. 1.3.

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1. Wadia, D.N., *Geology of India*, New Delhi, 1981 P. 338.

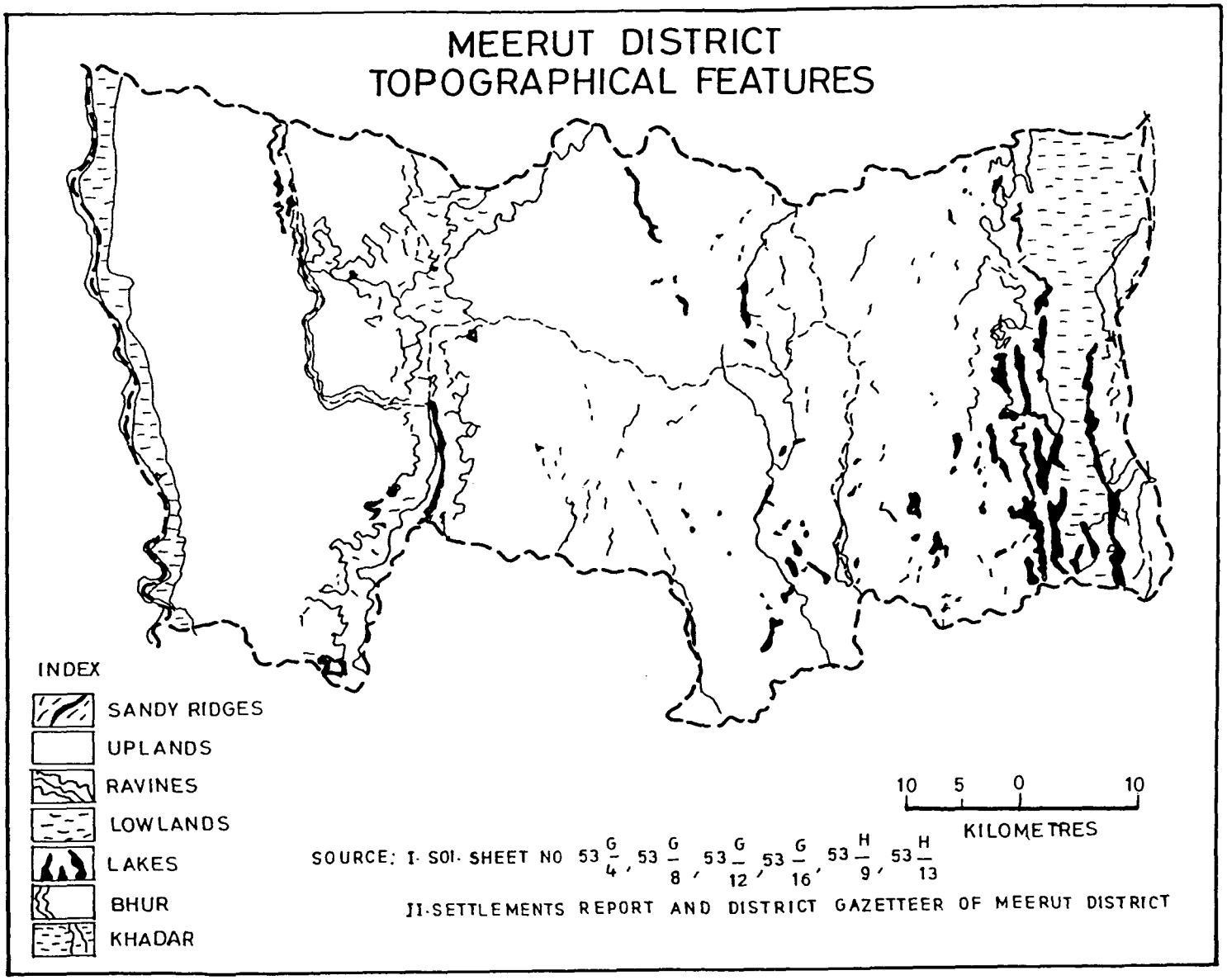


FIG. 1·3

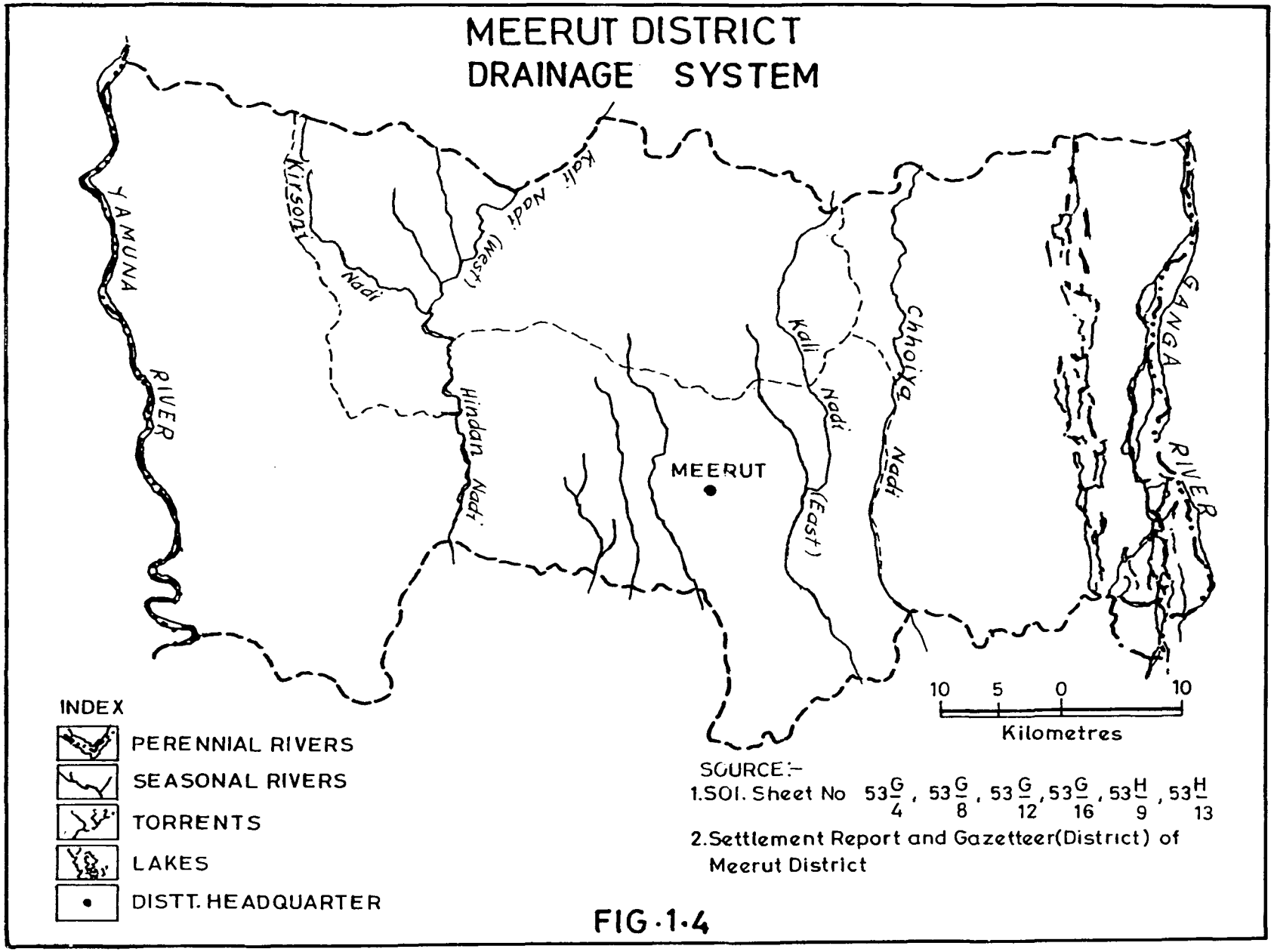
1.3 Drainage

The principal rivers of the District from east to west are the Ganga, the Hindan and the Yamuna, a brief description of which and of their tributaries is given below Fig. 1.4.

The Ganga River

The river first touches the District in the north-east near the village of Bela in tehsil Mawana. Its general direction is from north to south and throughout on the eastern flank it separates this District from those of Bijnor and Moradabad. In the District it has only two tributaries, the Burhganga and the Soti, both insignificant streams. The former flows in an old bed of the Ganga and the latter joins the river at the village of Jalalpur in tehsil Mawana.

The bed of the river is sandy and there is an underlying stratum of nodular lime stone here and there. The river's volume and velocity vary at different periods of the year and are greatest during July and August. In summer it is hardly a furlong wide but during the rainy season its span exceeds 1.5 kilometres. It is fordable only at particular places during the cold weather. Its banks generally suffer from slow erosion and the soils of the *khadar* villages, which lie adjacent to it from increasing infertility due to the sand that it deposits when in flood, which is usually in the monsoon months.


MEERUT DISTRICT
DRAINAGE SYSTEM
YAMUNA RIVER
Kirsoni Nadi
Kali Nadi (West)
Hindan Nadi
MEERUT
Kali Nadi (East)
Chhoiya Nadi
GANGA RIVER
10 5 0 10
Kilometres
INDEX
PERENNIAL RIVERS
SEASONAL RIVERS
TORRENTS
LAKES
DISTT. HEADQUARTER
SOURCE:-
1.SOI. Sheet No 53 G/4, 53 G/8, 53 G/12, 53 G/16, 53 H/9, 53 H/13
2.Settlement Report and Gazetteer(District) of Meerut District

FIG·1·4

The Burhganga River

This is a small tributary of the Ganga and is a fluctuating stream entering the District from Muzaffarnagar at the village of Firozpur Saifpur. Its name meaning 'Old Ganga' indicates that it flows in a bed in which the Ganga once flowed. It is a sluggish and irregular stream and is not of much use on the whole.

The Kali River

This river is also known as the *Nagin* (probably on account of its serpentine windings) and also as the *Kali Nadi* (East) to distinguish it from the *Kali Nadi* (west), a tributary of the Hindan. Generally it traverses undulating sandy slopes, which are rarely cut up into ravines. The river has no important towns on its banks and carries very little water except during the rains when it is about 45 metres wide, the breadth increasing to about a furlong in exceptionally wet years. It is joined in its course by three smaller streams, two of which are known by the generic name of *Chhoiya*.

The Hindan River

This river enters the District from Muzaffarnagar at the village of Pitlokhar in tehsil Sardhana and flows south-south west in a tortous course till it leaves the District. Two of its tributaries are the Krishni and the Banganga, which join it near Barnawa, which is a village of importance on its banks. The breadth of the river varies from a furlong in the hot weather

to about 0.8 kilometres in the rains. It is fordable for most of the year except during the rains when it is also navigable. It is used as a sort of link between the Ganga and the Yamuna. The Hindan is an active river from the point of view of soil erosion. As the river proceeds southwards the *khadar* widens out on both sides of its banks. Although it is affected by a saline efflorescence known as *reh* its waters are used for irrigating the rabi crops.

The Krishni River

The Krishni or Karsuni, a small stream between the Yamuna and the Hindan, enters the District near the village of Tikri and after flowing 19 kilometres joins the Hindan near the village of Barnawa. It is an insignificant stream with no towns on its banks and is little used for irrigation.

The Banganga River

Another insignificant, stream between the Yamuna and the Hindan is the Banganga, which enters the District from Muzaffarnagar at the village of Dhanaura. After traversing a distance of 12.8 kilometres it meets the Hindan at the village of Shahpur in Barnawa. It sometimes dries up during the summer but gets filled up during the rainy season.

The Yamuna River

According to a Hindu legend this river is supposed to be a goddess being the daughter of surya, the sun god. It first touches the District about 3.2 kilometres north of Tanda and flows southwards forming the boundary

of the District as far as the point where the District of Meerut, the Delhi state and the District of Rohtak meet. There is considerable variation in the height of its left bank which in tehsil Baghpat is characterized by the existence of steep and abrupt ridges some of which are flat and comprise the sites of largest habitations. The small low lying areas between the bank and the river are often affected by leaving alluvial deposits. The width of the river is about 0.2 kilometres in the hot weather when much of the water is drained off by the canals, making it fordable almost everywhere.

Lakes and Jhils

True swamps hardly exist in the District but at times wide stretches of water occur along the river beds. There are few *jhils* of importance in the blocks of Chhaprauli, Kotana, Baraut and Baghpat, the chief being in the *khadars* of Ganga and Yamuna.

Climate

The District of Meerut experience a subtropical monsoon type of climate which is characterized by a seasonal rhythm produced by the southwest and northeast monsoons. The reversal of the prevailing winds takes place regularly twice in a year. The winds of continental origin blowing from November to middle of June are dry while in the other parts of the year, i.e., from mid June to October, they are oceanic in nature and are

wet. On the basis of direction of the winds the year is divided into two seasons:

The season of northeast monsoons

The season of southwest monsoons

The direction of the winds in the region is generally from northwest to southeast during the northeast monsoon season and from southeast to northwest during the southwest monsoon season. The season of southwest monsoon is commonly known as 'rainy season' and is characterized by cloudy weather, heavy rainfall and high relative humidity. The northeast monsoon remains dry barring few rainy spells on account of western disturbances but is mainly characterized by intense cold in some months and intense heat in the other. On the basis of these changes in rainfall and temperature, the Indian Meteorological Department has divided the whole year into four seasons:

Cold weather season from December to February

Hot weather season from March to mid June

Season of general rains from mid June to September

Season of retreating monsoon from October to November

Common people of Meerut Districts, however, follow the agricultural calendar, which recognizes three seasons corresponding with major agricultural activities.

1. Cold weather season (November to February)
2. Hot weather season (March to mid June)

3. Rainy season (Mid June to October)

Cold Weather Season

This season corresponds to the period of rabi season. The crops of this season require less water than those of the *kharif* season. Due to low temperature on the surface, evaporation does not take place and it leads to low humidity of the air (Table 1.2). The air remains dry in this season. The season is rainless except for a small amount of rain caused by the western disturbances. The cloudy weather normally lasts a day or so and is followed by clear skies.[1] During the months of cold weather season the average number of rainy days does not exceed more than two but whenever the damp cloudy weather persists, it produces various plant diseases, which have an adverse effect on the crop. In the last month of the season with increasing heat a strong local and thermal effect is added to the western disturbances with the result that thunder storms, hail storms and occasionally tornadoes make their appearances and bring some rains.

The total amount of rainfall caused by the winter depression is small. The rainfall is low, irregular and sporadic. It is locally heavy where the thunder storms are associated with disturbances. The rainy period is also of short duration but the amount of rainfall though small is highly beneficial to the winter crops as it comes at a time when the plants are flowering. The

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1. Monthly and Annual Normals of Rainfall and Rainy days; *Memoirs of the Indian Meteorological Department*, Vol. XXVII, part IV, Delhi, 1949, p.152.

Table 1.2
Temperature and Relative Humidity in Meerut district (1990)

Months	Mean daily Maximum	Mean daily Minimum	Relative Humidity
January	21.15	6.31	86.90
February	22.86	9.05	76.68
March	27.98	12.44	68.22
April	36.49	19.42	49.83
May	40.11	24.25	39.80
June	36.42	25.21	61.80
July	30.74	26.20	85.80
August	31.10	24.51	86.00
September	23.38	23.77	62.60
October	31.70	15.70	72.58
November	26.72	10.63	79.06
December	22.01	8.80	83.06
Annual	**29.22**	**17.19**	**71.02**

Temperature (^{0}C)
Source: Memoirs of the Indian Meteorological Department, Vol. VI, p. 195, 1990.

effectiveness of the rainfall is further increased by the prevailing low temperatures. The hailstorms which sometimes occur in the area are of very limited duration and affect small and scattered areas. They cause little damage it covering at the early period of the cold weather season but a considerable damage is done to the crops when they occur at the time of the flowering of the crops and when the grains are immature. The area affected by this unfortunate natural disaster is very small and even within this area the damage is far from uniform. Its affect varies enormously from field to field. One field may be seriously affected while the crop in the other on a short distance may escape almost untouched.[1] The month of February experiences a little change of weather except for a little increase in temperature.

Hot Weather Season

With the gradual northward movement of the sun, temperature rise quickly and the atmospheric pressure fall over the heated land. The hot weather period extends from March to June. The rise of temperature in March and clear skies with light westerly winds of the day and relatively cool nights produce good effect on the ripening of the rabi crops. In April the days are usually hot while nights remain still cool. The mean monthly relative humidity decreases to a considerable extent. The months of May and June record exceptionally high temperature while as may be as high as

1. Moreland, W. H., '*The Agriculture of United Province*', Allahabad,1912, P. 29.

40 and even more for a few days (Table 1.2). In hot season winds blow from west, northwest to east and southeast. In the months of May and June the hot winds known as *loo* originate as a result of the convective air movement produced by the heating of the surface air and rapid decrease of temperature as one goes up in the atmosphere.[1] Dust storms locally known as *aandhis* usually occur in the afternoons. These squally, blinding dusty winds are common phenomena in these regions.

Season of General Rains

On account of excessive heat, a low pressure develops in northern part of India and by the middle of June, it brings a complete reversal in the air movement. The winds begin to move from Indian ocean to the landmass. These humid oceanic southwesterly winds bring heavy downpours, which reduce temperature of the area.

In the study area, the commencement of the monsoon rain varies from last week of May to first week of July but generally it sets in during the second or third week of June and continues till the end of October. The sudden arrival of monsoons transforms the whole landscape. July and August are the rainiest months of the year and about 55 per cent of the total annual rainfall occurs during these months. The average rainfall is about 75cms. The maximum and minimum temperature gradually falls from

1. Blanford, H.F., "Hot winds of north India; *"Memoirs of Indian Meteorological Department*, Vol. V, No. 6, 1886, Calcutta, PP. 162 -195.

36.42°C and 25.21°C in June to about 30.74°C and 26.20°C in July as shown in Fig.1.5. The relative humidity remains over 70 per cent throughout the rainy season.

The region receives rainfall from the Bay of Bengal and Arabian Sea branches of southwest monsoon but by the time these branches reach the area they become somewhat weak and consequently rainfall of the District is relatively low and uncertain in comparison to eastern Districts of Uttar Pradesh. Almost 90 per cent of the total annual rainfall is received during this season, which is the most important season of the year from agricultural point of view. The region receives on an average about 40-50 cm of rainfall during this period. The rainfall is sporadic, short lived, subject to great local variations and frequently repeated about the same hours day after day for many days in succession. The distribution of rainfall is not uniform. It decreases gradually from northeast to southwest.

The rainfall in this region brings relief from the intense heat of the day and is helpful in the preparation of fields for sowing of kharif crops but when winds are violent and are accompanied by clouds for more than two days with little rains they cause immense damage to the mango crop.

Monthly distribution of rainfall is not uniform throughout the season. Generally, rainfall starts by the third week of June, remains steady in July and August and decreases in amount by September. The rainfall in the wet

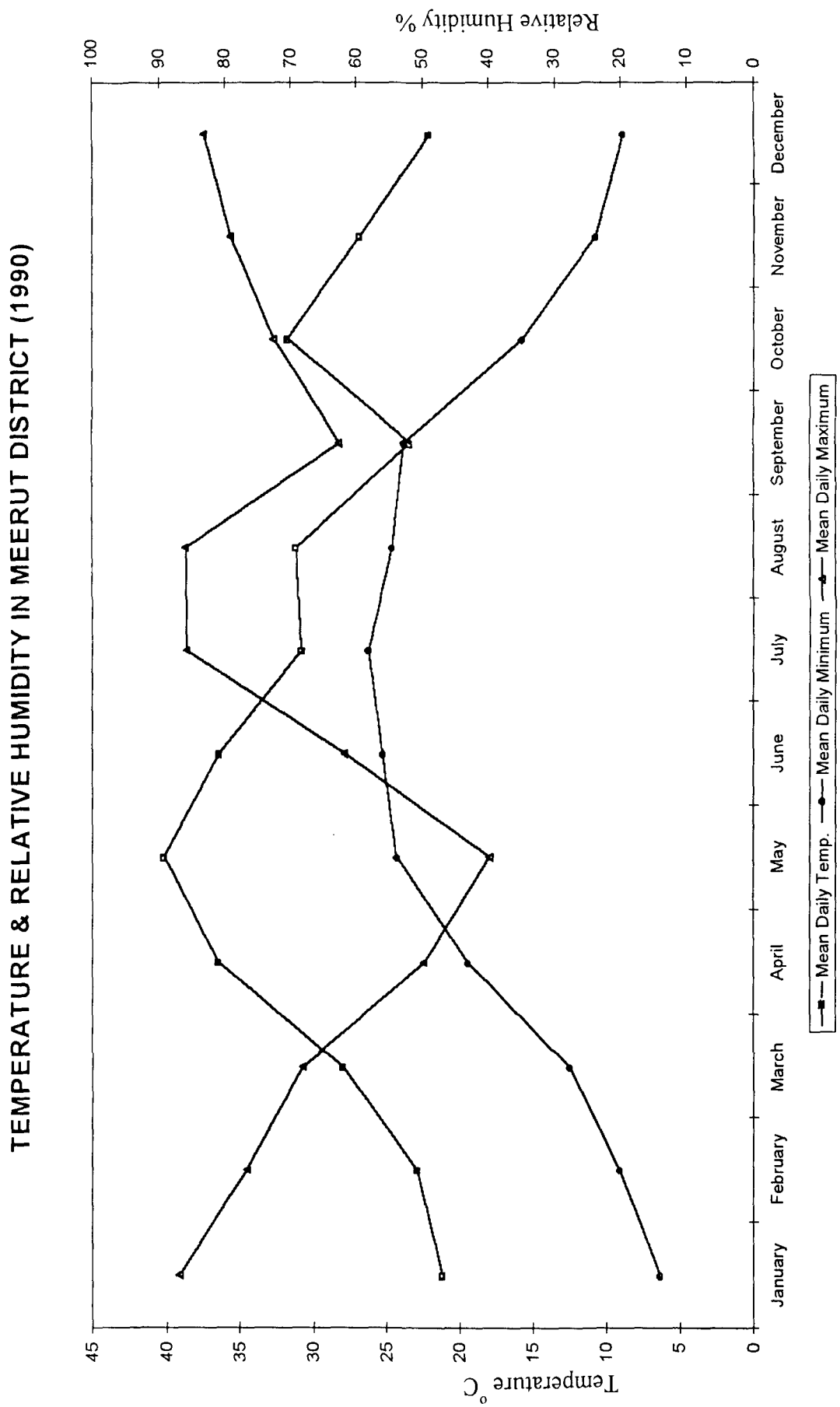

TEMPERATURE & RELATIVE HUMIDITY IN MEERUT DISTRICT (1990)
Temperature °C
Relative Humidity %
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
80
90
100
January
February
March
April
May
June
July
August
September
October
November
December
Mean Daily Temp.
Mean Daily Minimum
Mean Daily Maximum

FIG. 1.5

monsoon months decreases from east to west as from north to south. The westward decreases, however is not marked than the decrease towards the south. The decrease of rainfall is not so high and well marked towards east to west but a significant decrease is found from north to south. The incidence of rainfall is not continuous throughout the season. Outburst of rain alternates with spells of fine weather, which are very useful for the growing crops of the season. The spells of fine weather, which do not last many days are produced by a shoulder of high pressure, embracing the whole area and pushing the axis of low pressure trough of Northern India towards the foot of the hills. Such a succession of intermittent rain and dry weather is most welcome to the farmers but if the rainless period exceeds ten or fifteen days, it may affect the kharif crops particularly sugarcane adversely.

It is now needless to say that the rainfall in this area is unreliable during the months when its regularity is most needed. Such uncertainties in rainfall, especially in the area where agriculture is reduced to more gamble with the monsoon due to lack of irrigation facilities have an adverse effect on agriculture.

In September, the rain normally slackens and rainless intervals become longer and day temperatures begin to rise. The relative humidity remains as high as 78 per cent and the cloud amount decreases to 4 per

cent. The low cloud amount, the long intervals between the rainy days, high humidity and high temperature, calm atmosphere with almost, motionless air make the month of September sultry.

In October, there is further decrease in the amount of rainfall but the mean maximum temperature remains as high as that in September. However, the humidity combined with an almost motionless air makes the months of September and October very oppressive and leads to the outbreak of a number of seasonal diseases.

1.5 Soils

The soils of the study area have been studying and classified by the Revenue Department of the Government of Uttar Pradesh for revenue assessment purposes. A textural classification of these soil types is published in the Settlement Reports ana District Gazetteers of Meerut. Besides these, the latest information on texture and chemical characteristics of soils was published in four volumes of Soil Survey and Soil works in Uttar Pradesh in Allahabad. Usually the area under study is included into broad belt of alluvial soils without any further subclassification.[1] A textural classification of soils on the basis of colour,

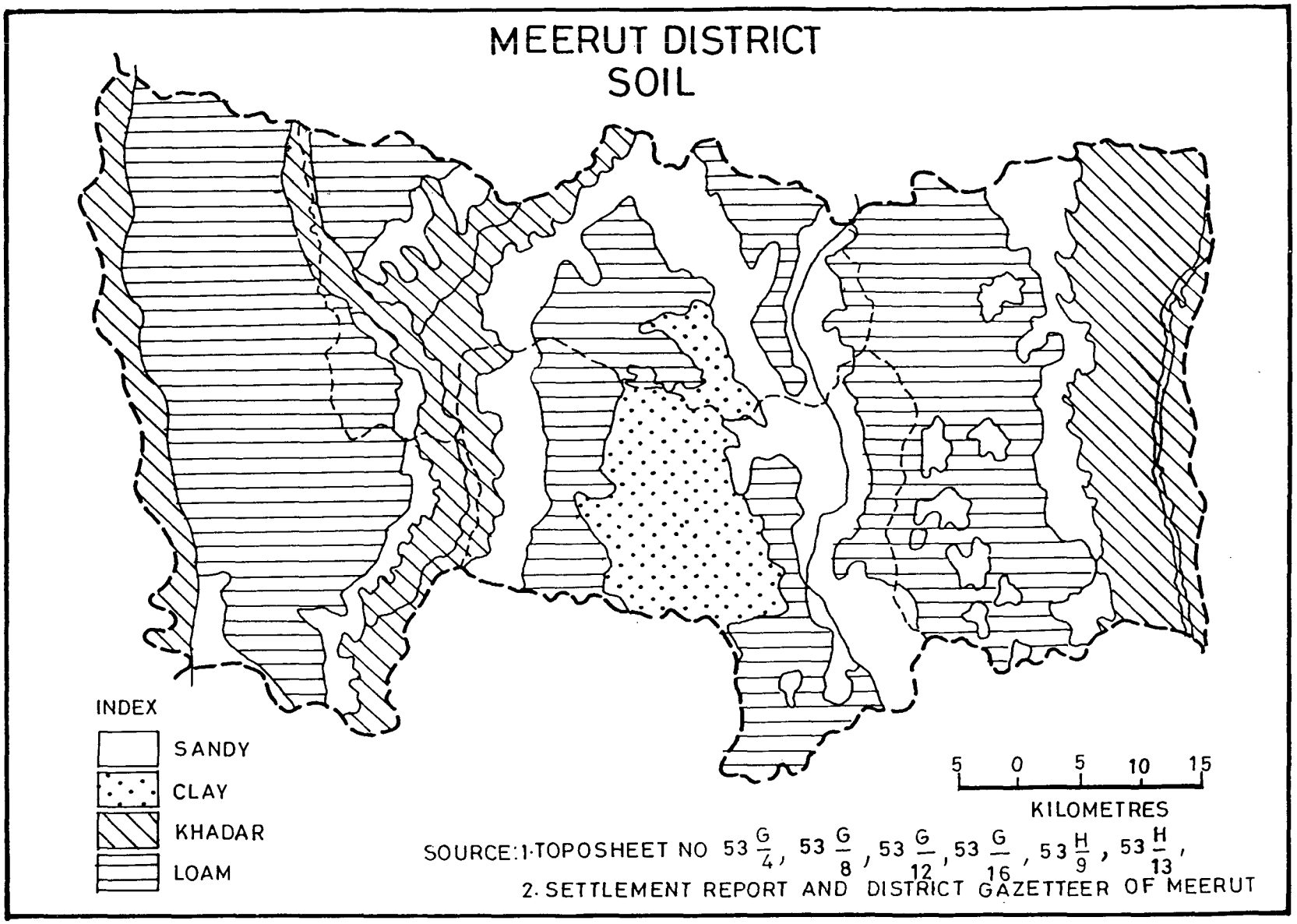
1. D.N. Wadia, Krishnan, M.S. and Mukerjee, P.M. , Soil map of the geological Survey of India, *Memoirs of the geological Survey of India*, 1935, Plate XXV.

texture, availability of water and level of land has been attempted in these records.

The chemical soil of the region is classified on geological basis under two divisions; the new alluvium and the old alluvium, also known as *khadar* and *bhangar* respectively. Casual distribution between the two is somewhat difficult but usually the older deposits occupy higher lands and the newer deposits, the lower lands in the immediate neighbourhod of the rivers. The area under older deposits, however is much greater than that of the newer deposits Fig. 1.6.

khadar or New *Alluvium* Soils

The *khadar* is sandy in composition and generally light in colour. It varies generally in texture from sand to silty sand. The khadar land is found in narrow strips along the rivers Ganga, Yamuna,Hindan. The *khadar* of the Ganga and the Yamuna is sandy whereas the Hindan soil is silty sand. The *khadar* of the Ganga, Yamuna and Hindan attains its maximum width of about 4 kilometres. It varies in texture from gravel and sand in the upper courses to silt and silty clay in the lower courses of the rivers. During the period of heavy rains the ground get saturated and very often the sowing of rabi crops has to be deferred. Successive deposits of alluvial silt gradually raises the ground level till the land becomes entirely free from annual inundation. At such places *khadar* is extremely productive. The productivity


MEERUT DISTRICT
SOIL
INDEX
SANDY
CLAY
KHADAR
LOAM
5 0 5 10 15
KILOMETRES
SOURCE: 1. TOPOSHEET NO 53 G/4, 53 G/8, 53 G/12, 53 G/16, 53 H/9, 53 H/13,
2. SETTLEMENT REPORT AND DISTRICT GAZETTEER OF MEERUT

FIG·1.6

diminishes in places when the rivers take a sudden change in their courses owing to the accumulation of sand.[1]

The *khadar* soil becomes almost dry in times of low rainfall and is heavily leached when the rainfall is heavy. The waterfall in the *khadar* lands is high and in the rainy season it comes close to the surface. The agriculture is not free from danger due to the water logging and floods. The sandy soil is utilized for the cultivation of maize, pulses and broadest rice in the kharif season while the sandy silt is used for the production of millets, barley, gram and lentil occupy the largest area during the rabi season.

Bhangar Soil

Bhangar or old alluvium is more clayey in composition and generally dark in colour. On the basis of texture, the bhangar soils have been further subdivided into four divisions:

a. Loamy
b. Clayey loam
c. Sandy loam
d. Alkaline soils

Loamy Soil

It occupies a considerable area of bhangar land. Texturally, it is sandy loam and gradually changes to silty clay, wherever the land is low

1. Ray Chaudhary, S.P., *Soils of India*, Indian council of Agricultural Research, New Delhi, 1963, PP. 385 -387.

lying and is liable to water logging the soils become clayey. The surface soil is light yellow to brown in colour. It is rich in organic matter. It has usually a high water holding capacity and is capacity of producing good crops if irrigation facilities are available.

The soil is generally very fertile and is produces a variety of crops. Generally, transplanted and broadcast rice, maize, millets, sugarcane and *kharif* pulses are grown in the *kharif* season, whereas wheat, barley, peas and gram are the dominant crops of the rabi season.

Clayey Loam

As compared to the loamy soil it is rich in clay and has a relatively high water retaining capacity. The soil is brownish in colour and in the lower horizons deepens to a dark grey in which is known locally as matiar. The soil is stiff and is of heavy in texture. This soil has a zone of *kankar* formation at lower depths. The soil below *kankar* is generally sandy and does not contain much clay. The calcium from the surface is leached and accumulates at various depths in the form of *kankar* nodules. The presence of *kankar* impedes the drainage with the result that during the rainy season water at places is head up and becomes stagnant.

This soil occurs in the central portion of the region stretching from north to south throughout the area. The proportion of clay decreases in high lying areas and the soil becomes loamy but in shallow depressions the soil

is predominantly clayey as the fine particles from the high lying areas are washed out and get redeposited in these depressions. The soil in the low lying areas is best suited for the cultivation of transplanted rice.

In the northern tract of this soil the water table is high, the irrigation facilities are adequate but in the southern tract of this soil, the water table is relatively low. The tract therefore, produces good crops in kharif as well as in rabi season. Principal crops during the kharif season are sugarcane, maize and rice and in rabi season wheat, potato, barley, gram, peas and lentil occupy the largest area.

Sandy Loam

This soil occurs to the west of the loamy tract. Texturally the soil is predominantly sandy and the colour ranges from yellow through brown to reddish brown. It contains humus but lesser than loamy soils. Without irrigation and manuring the soils becomes weak in crop production. The water holding capacity is generally low. The main crops grown in this soil are millets, pulses, maize, tobacco and groundnut in *kharif* and barley, peas and potato is *rabi* season. Sugarcane also grows where irrigation facilities are available.

Alkaline Soils

The Saline or alkaline soils popularly known as *reh.* Usar are found scattered in vast stretches. Usually these soils are found interspersed with

agricultural lands. The main cause of their occurrence in the study region are attributed to the arid climate coupled with poor external and internal drainage of the area. The Himalayan rivers and their tributaries transport salts in solution which go on percolating into the soil of the plains. In those areas which suffer from low rainfall and have no proper surface drainage, these salts keep on accumulating by leaching from neighbouring regions. During the dry months the soluble salts are sucked up in solution by capillary action to the surface and are deposited there in the form of white efflorescence, In this way the land having being impregnated with these salts are lost to agriculture. Soil scientists have made investigations and have suggested certain methods for improvement of drainage, use of organic manures, solution of salts tolerant crops and use of chemical substances. In this way the Usar land can be made useful for cultivation purposes.

1.6 Natural Vegetation

The khandaw of the Mahabharata and such fragmentary references throw sufficient light on the predominance of natural forest vegetation in the past. The District forms part of the northern subtropical deciduous type of vegetation division but as it is devoid of extensive natural vegetative cover. The trees generally found here are *Shisham, Peepal , Jamun*, Mango, *Siris, Imli*, and *neem*.

The main areas where some vegetation can be seen are the khadars of the Ganga,Yamuna and Hindan and the adjacent ravined strips, the former being covered mostly with Tamarind, coarse grasses such as *munj, kans* and *patera* and straggling bushes of *ber.*[1]

The District is deficient in jungles but is fairly well provided with groves. Ornamental trees found in gardens and groves are usually the *Kachnar, Gulmohar, Ashok, Amaltas, Eucalyptus* and *Chameli.* The shrubs and bushes chiefly found in the District are *arua, hins, panwar, madar, karaunda* and *makoh* and the chief grasses are *munj, kans* and *patera.*

2. CULTURAL SETTING

The cultural landscape is fashioned from a natural landscape by a culture group. Culture is the agent, the natural area is the medium, the cultural landscape is the result.[2] Physical features of an area condition the nature of its agrarian economy. Fertile soil, level topography and favourable climatic conditions made this region agriculturally very important. Hence an attempt has been made here to discuss the characteristics along with the distributional pattern of the cultural landscape, of the District viz., land cover and land use, agriculture, transport system, industries and rural market centres. This analysis of the elements of the cultural landscape will

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1. District Gazeteer, Meerut.
2. Sauer, C.O. 1925: The morphology of landscape. Reprinted in Leighly, J., ed.,1974: Land and life *:selections from the writings of Carl Ortwin Sauer.* Berkeley, CA: University of California Press, PP. 315-350.

help in comprehending population and settlement patterns in the study area.

2.1. Land Use

The pattern of land use in the study area is determined by two sets of factors (a) the physical factors like topography, climate and soil which broadly determine the capabilities of the land and (b) the human factors like the length of occupance, density of population, social and economic institutions, etc. The land use pattern of the Meerut District is given in Table 1.3 and shown in Fig. 1.7, which reveals that about 80.33% of the total area is net sown. Machra block has the highest percentage of net sown area (88.64%), followed by Mawana Kalan (86.06%), Kharkhauda (85.92%), Pilana (84.73%), Janikhurd (84.06%), Rajpura (84.02%), Daurala (83.67%) Rasulpur Rohta (83.63%), Baraut (83.34), Saroorpur Khurd (82.13%), Sardhana (81.77%), Chhaprauli (81.43%), Baghpat (81.42%), Binauli (80.84%), Khekra (79.13%), Parikshitgarh (70.02%), Meerut (69.7%), and lastly Hastinapur (68.07%). It may be marked that the blocks with low percentages of net sown area are mostly *usar* infested.

The area not available for cultivation in the District is 11.23%, while cultivable waste and fallows comprise 4.63%. Pastures forests and miscellaneous trees comprise 2.4% while usar and uncultivable waste comprise 1.4% of the land of the District.

Table 1.3
Meerut District: Land Use and Land Cover – 1992-93

S.No.	Blocks	Net Sown Area (Hectares)	Usar and Uncultivable Waste	Area under Non Agriculture	Cultivable waste and Fallows	Pastures Miscellaneous Trees and Forests
1	Chhaprauli	14883	391	1879	1121	1
2	Baraut	19588	244	2618	1039	14
3	Baghpat	15766	376	2352	599	271
4	Pilana	17335	141	1916	939	129
5	Khekra	12698	335	2006	889	119
6	Binauli	21693	169	2358	1634	979
7	Saroorpur Khurd	15675	244	1770	975	421
8	Sardhana	14133	189	1948	943	70
9	Daurala	14546	369	1954	465	50
10	Mawana Kalan	17058	74	1813	590	285
11	Hastinapur	22766	138	5562	2581	2395
12	Parikshitgarh	21239	1262	3159	1732	2938
13	Machra	15633	63	1769	166	5
14	Rasulpur Rohta	14351	171	2099	521	18
15	Jani Khurd	15013	178	2064	526	79
16	Meerut	10054	348	2039	1029	954
17	Rajpura	14926	244	1910	654	30
18	Kharkhauda	16951	242	1926	555	54
		294308	**5168**	**41140**	**16958**	**8812**

Source: Compiled from statistical Magazine of District, Meerut, Institute State Planning, U.P., 1992-93.

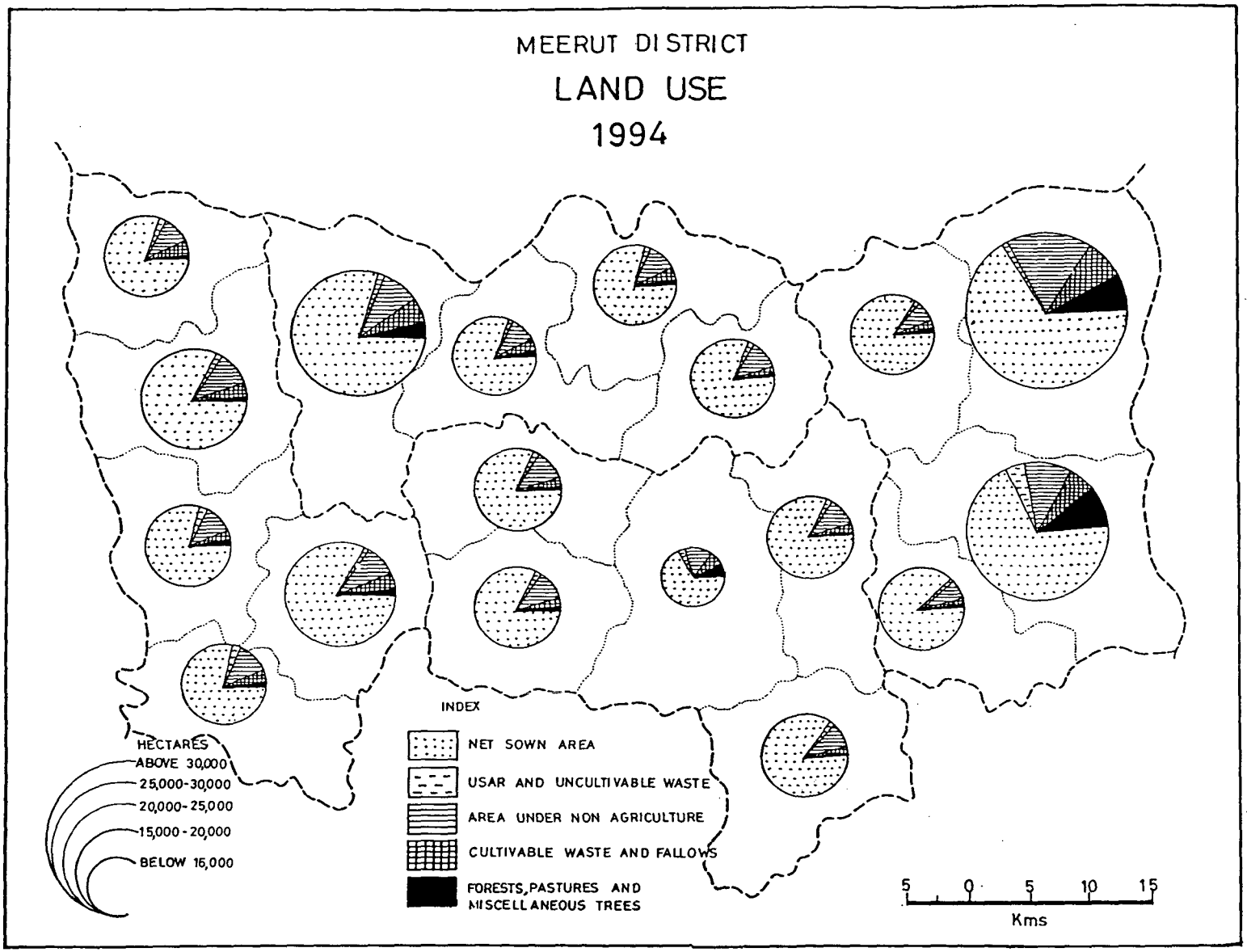

MEERUT DISTRICT
LAND USE
1994
INDEX
NET SOWN AREA
USAR AND UNCULTIVABLE WASTE
AREA UNDER NON AGRICULTURE
CULTIVABLE WASTE AND FALLOWS
FORESTS, PASTURES AND MISCELLANEOUS TREES
HECTARES
ABOVE 30,000
25,000-30,000
20,000-25,000
15,000-20,000
BELOW 16,000
5 0 5 10 15
Kms

FIG. 1·7

2.2. Cropping Pattern

Cropping pattern varies with differences in physico-cultural and socio-economic conditions. The Meerut District has a total cropped area of about 476700 hectares, block wise break up has been given in Table 1.4.

There are three harvesting seasons in the Meerut District, namely, rabi, kharif and zaid. During the rabi season, wheat, barley, arhar, gram, peas and mustard are the chief crops sown in the District. During the kharif season, sugarcane, bajra, paddy and maize are the principal crops. During the zaid harvest, some fodder crops and vegetables are grown in the study area. The block wise distribution of the area under different harvests has been shown in Fig. 1.8.

Rabi crops occupy 37.20% of the total cropped area of the District. It has been evident from the table that the Pilana block has the highest percentage (42.84%) of its gross cropped area under rabi crops whereas Mawana Kalan has the lowest proportion (31.67%)of its area cultivated during the rabi season.

During the kharif season, 56.30 per cent of the gross cropped area of the District is sown. Table 1.4 indicates that of all the blocks, Mawana Kalan utilizes highest percentage (61.28%) of the total cropped area, whereas the Meerut block utilizes the lowest (47.33%) of the total cropped area during the season.

Table 1.4
Meerut District: Cropping pattern, 1992-93

Block	Total Gross Cropped area (in hectares)	Percentage of total gross cropped Area		
		Area under Rabi crops	Area under Kharif crops	Area under Zaid crops
Chhaprauli	24138	34.46	59.64	5.89
Baraut	32189	35.70	58.62	5.65
Baghpat	26345	38.59	55.84	5.56
Pilana	29331	42.84	52.51	4.64
Khekra	21898	41.84	51.22	6.94
Binauli	34123	39.49	56.83	3.67
Saroorpur Khurd	25049	38.76	56.03	5.21
Sardhana	22228	36.44	58.01	5.55
Daurala	23528	35.18	58.74	6.08
Mawana Kalan	26615	31.67	61.28	7.03
Hastinapur	33630	35.37	58.29	6.30
Parikshitgarh	32606	33.85	60.00	6.13
Machra	24539	35.22	53.46	11.30
Rasulpur Rohta	23935	37.64	56.34	6.03
Jani Khurd	24084	34.45	55.16	10.38
Meerut	18732	41.83	47.33	10.84
Rajpura	24779	38.05	55.41	6.54
Kharkhauda	28951	39.66	53.74	6.60
Total of the Rural area	**476700**	**37.20**	**56.30**	**6.50**

Source: Compiled from statistical magazines of District, Meerut, Institute state planning, U.P., 1992-1993.

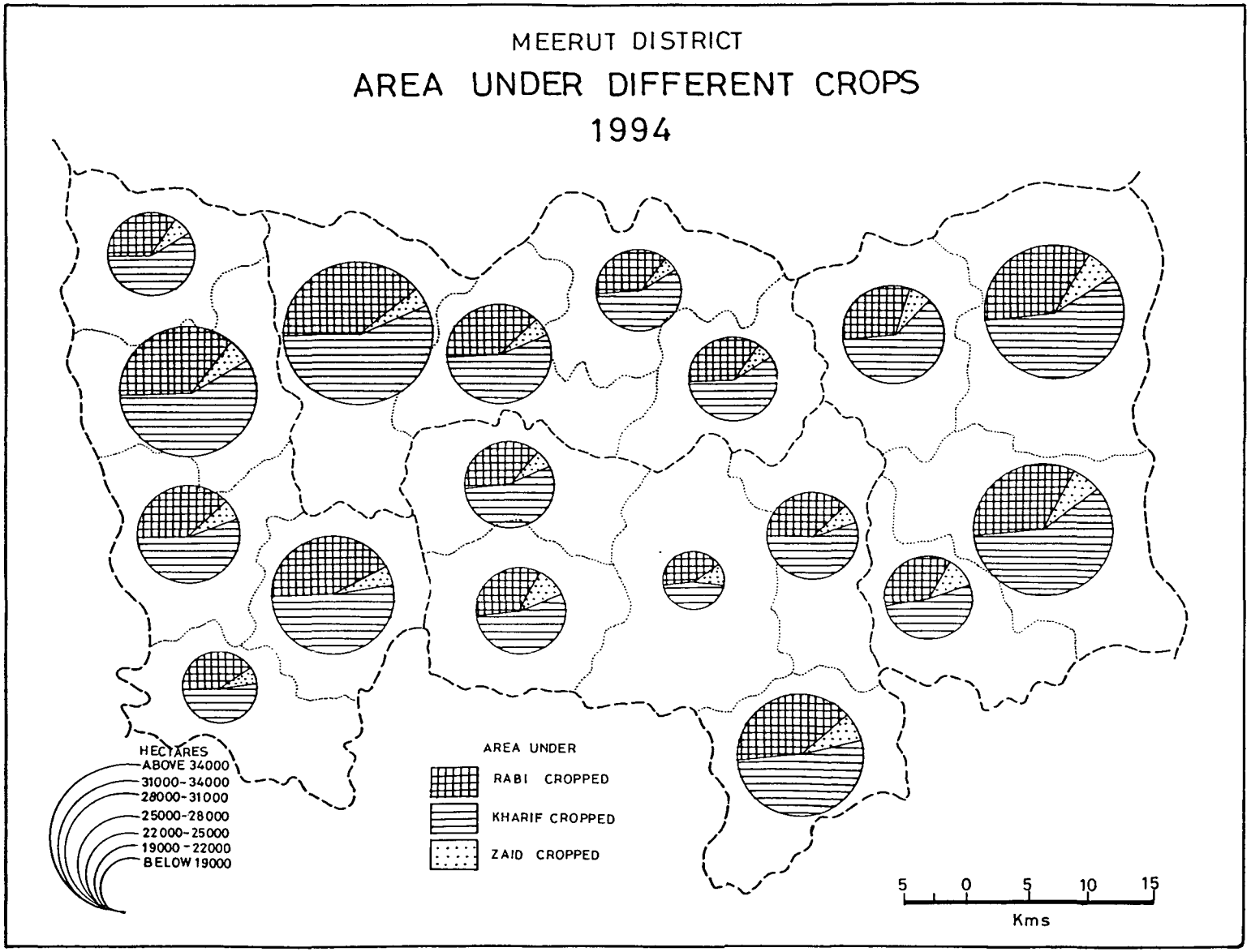

MEERUT DISTRICT
AREA UNDER DIFFERENT CROPS
1994
HECTARES
ABOVE 34000
31000-34000
28000-31000
25000-28000
22000-25000
19000-22000
BELOW 19000
AREA UNDER
RABI CROPPED
KHARIF CROPPED
ZAID CROPPED
5 0 5 10 15
Kms

FIG. 1-8

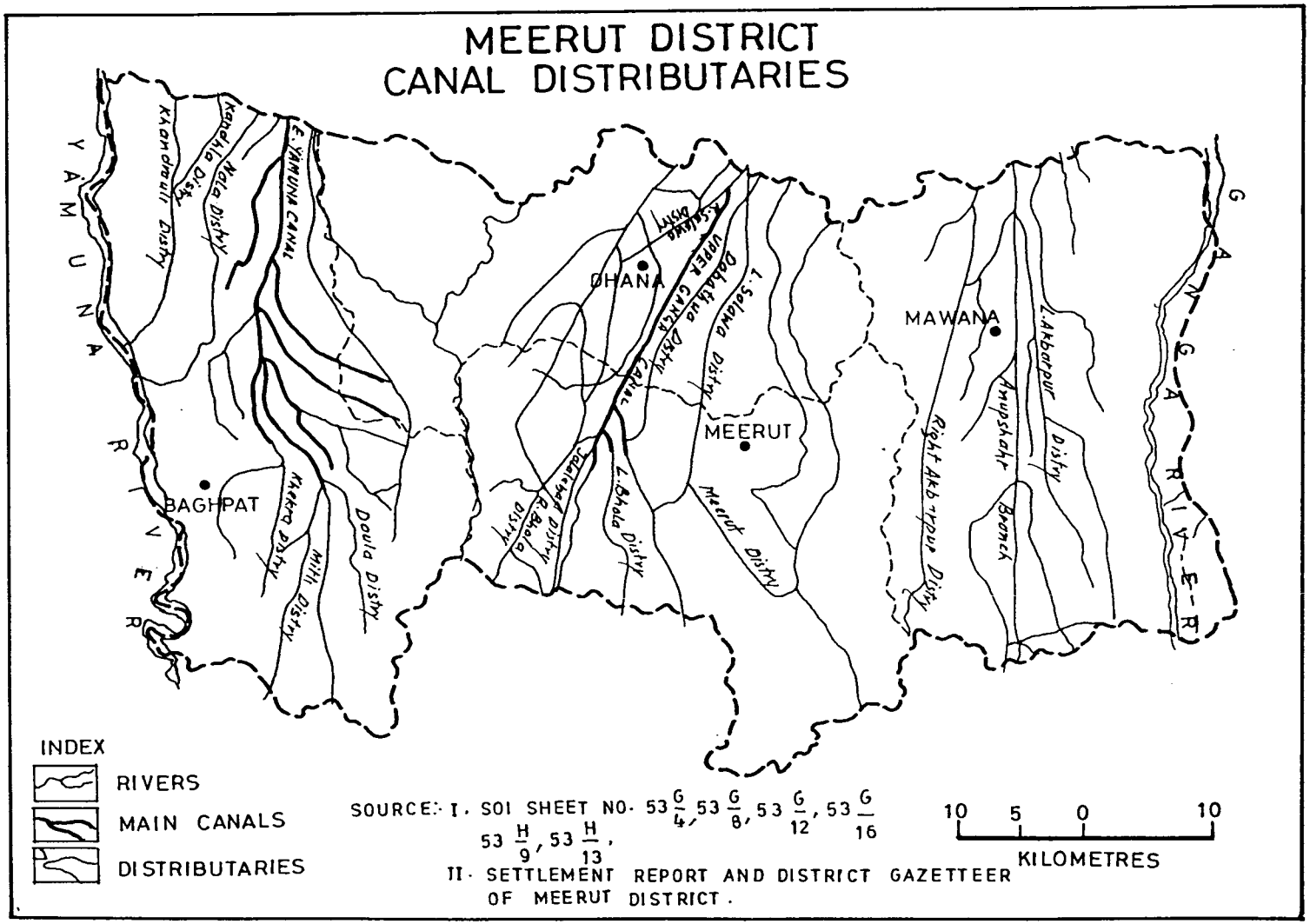
Zaid crops area of very little importance as only 6.5 per cent of the gross cropped area of the Meerut District is sown under these crops. Table 1.4 shows that the highest percentage (11.3%) of the total cropped are in this harvest is found in Machra block, while Binauli block has the lowest (3.67%) of the total cropped area under these crops.

2.3. Irrigation

One of the most important reasons of agricultural advancement in this District is the availability of abundant facilities for irrigation, particularly canal irrigation which has brought radical transformation in the economy of the place. Canals, tubewells and masonry wells constitute important sources of irrigation in the Meerut District. Canals irrigates 72129 hectares of land. Tubewells constitute the chief source of irrigation accounting for 74.47 per cent of the net irrigated area, followed by canals which irrigates 24.76 per cent. There are three lines of canals in the District. Fig. 1.9 shows the networks of canals in the District, which are given below :

The Eastern Yamuna Canal

This canal enters the District at the village of Kakripur in pargana Chhaprauli. Its water is considered to be better for cultivation than that of the Ganga Canal. It gives off a large number of distributaries. In the north are the Khandrauli and Kandhala which unite near Chhaprauli and fall into the Yamuna below Kotana and irrigates with the Nala distributary. Further south are the khekra and Mitli which irrigates the Baraut and Baghpat


MEERUT DISTRICT
CANAL DISTRIBUTARIES
YAMUNA RIVER
GANGA RIVER
E. YAMUNA CANAL
Kharad Nala Distry
Khanauli Distry
Upper Ganga Canal
Dabthua Distry
Kasiana Distry
L. Solana Distry
L. Akbarpur Distry
Anupshahr Branch
Right Akbarpur Distry
Meerut Distry
L. Abdala Distry
Jalalabad Distry
Daula Distry
Nirh Distry
Kharad Distry
DHANA
MAWANA
MEERUT
BAGHPAT
INDEX
RIVERS
MAIN CANALS
DISTRIBUTARIES
SOURCE:- I. SOI SHEET NO. 53 G/4, 53 G/8, 53 G/12, 53 G/16
53 H/9, 53 H/13.
II. SETTLEMENT REPORT AND DISTRICT GAZETTEER OF MEERUT DISTRICT.
10 5 0 10
KILOMETRES

FIG·1·9

blocks. To the east of the canal, there is, in the north, an important series of distributaries comprising the Fatehpur, Bijwara, Kishanpur, Baoli and Miranpur tail off into the river Hindan and irrigates in blocks of Chhaprauli, Baraut and Baghpat. The other important distributary is Daula which irrigates the east of Baghpat block.

The Ganga Canal

This canal enters the District from the District of Muzaffarnagar and irrigates the tract between the Hindan and the Kali Nadi (East). It flows in a south-westerly direction but inclines to the south near the town of Sardhana, avoiding contact with a line of sand hills which skirt the northern side of the town. It then runs along the central watershed in a series of curves. Its course lies about half way between Meerut city and the Hindan river but further south it approaches closer to the Hindan on account of the intervention of the Chhoiya Nadi at Jani Khurd, where an escape leads into the Hindan, the distance from the canal to the river being only 3.05 Km. It gives off a large number of distributaries in the District, the major ones being the right Jauli, left Salawa, Khatauli, right Salawa and Miranpur. In the southern part of the District the important distributaries are Puth, right Bhola, left Bhola and Tikri.

The Anupshahr Branch

The Anupshahr branch of the Ganga canal irrigates the tract lying between the Kali Nadi (East) and the Ganga *khadar* and the Hindan cut. It

enters the District in the north of block of Hastinapur. It has on both sides a network of distributaries and minor channels, two of the most important being the Salarpur and the Churiala distributaries.The former runs for a long distance past Niloha in Hastinapur and falls into the Chhoiya Nadi in the west of pargana Kithore, the latter divides into many branches which water the north east portion of Hastinapur. The other important distributary is the Akbarpur distributary which leaves the left bank of the main line and flows south, parallel to the canal, to opposite Parikshitgarh. The Parikshitgarh branch takes off at 48.9 km. and flows through the Kithore.

The Meerut District enjoys the benefit of having all the three sources of irrigation rivers, canals and ground-water. The gross and net irrigated area in the year 1992-93 were 470363 hectares and 291301 hectares respectively. The block wise break-up of the irrigated areas in the Meerut District by different means of irrigation is presented in Table 1.5 and Fig. 1.10. It is clear from this table that the net irrigated area by different means ranges between 10054 hectares in Meerut and 21372 hectares in Hastinapur. Out of the net irrigated area of the District, 68.96 per cent is irrigated by private tubewells, while 5.51 per cent, 24.76 per cent, 0.58 per cent is irrigated by Government tubewells, canals and masonry wells respectively. Irrigation by privately owned tubewells is more common in Rajpura block (88.15%), followed by Kharkhauda (83.79%) and Binauli (83.27%). Canal irrigation is more common in Jani Khurd block (59.49%), followed by Chhaprauli (44.04%) and Baraut (39.38%).

Table 1.5
MEERUT DISTRICT: AREA COVERED BY DIFFERENT MEANS OF IRRIGATION

S.No.	Blocks	Canal	Govt. Tube well	Private Tube well	Masonary well	Ponds	Others	Net Irrigated area (in hectares)	Gross Irrigated area (in hectares)
1	Chhaprauli	44.04	--	55.95	0.013	--	--	14830	23944
2	Baraut	39.38	1.66	58.74	0.21	--	0.010	19539	32085
3	Baghpat	33.83	1.34	63.85	0.99	--	--	15766	26344
4	Pilana	21.70	4.32	72.31	1.66	--	--	17330	29123
5	Khekra	16.32	7.69	69.39	6.10	--	0.49	12667	21581
6	Binauli	3.57	13.15	83.27	--	--	0.014	21298	33297
7	Saroorpur Khurd	31.79	8.62	59.09	0.50	--	--	15192	23901
8	Sardhana	30.08	3.15	66.76	--	--	--	14114	22168
9	Daurala	23.53	4.92	71.55	--	--	--	14546	23528
10	Mawana Kalan	33.38	2.07	63.37	1.17	--	--	17049	26347
11	Hastinapur	19.69	1.53	78.01	0.23	0.042	0. 49	21372	30513
12	Parikshitgarh	27.69	4.18	68.09	0.034	--	--	20686	31297
13	Machra	22.94	6.66	70.39	--	--	0.006	15629	25804
14	Rasulpur Rohta	21.19	6.1	72.68	--	--	0.014	14351	23935
15	Jani Khurd	59.49	3.53	36.95	0.01	--	--	15002	24067
16	Meerut	19.74	5.44	72.39	--	--	2.43	10054	18707
17	Rajpura	0.72	11.09	88.15	--	--	0.026	14926	24772
18	Kharkhauda	1.24	13.75	83.79	0.59	--	0.62	16950	28950
Total of the rural area		**24.76**	**5.51**	**68.96**	**0.58**	**0.003**	**0.18**	**291301**	**470363**

Source: Compiled from statistical Magazine of District, Meerut, Institute State Planning, U.P., 1992-93.

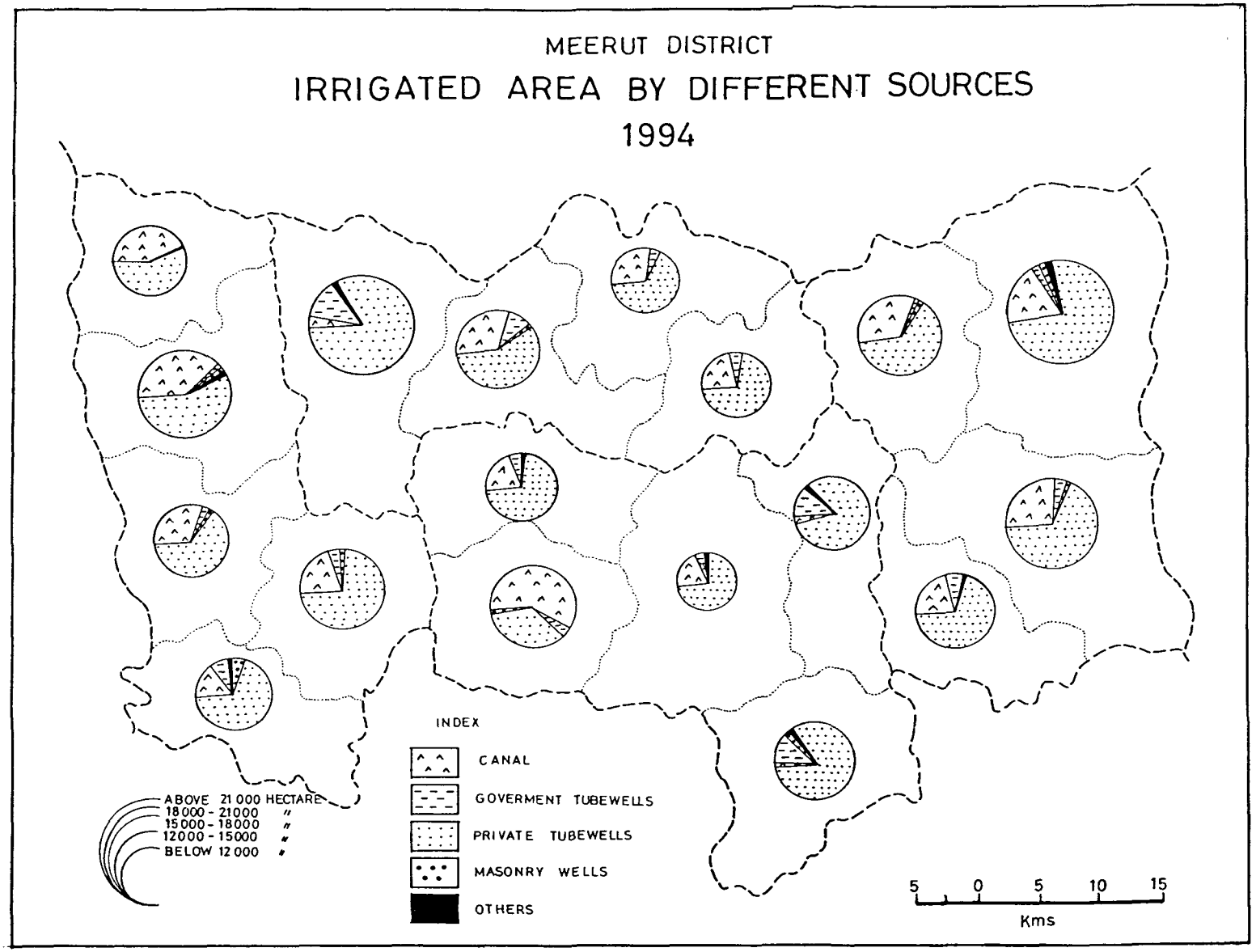

MEERUT DISTRICT
IRRIGATED AREA BY DIFFERENT SOURCES
1994
INDEX
CANAL
GOVERMENT TUBEWELLS
PRIVATE TUBEWELLS
MASONRY WELLS
OTHERS
ABOVE 21 000 HECTARE
18000 - 21000 "
15000 - 18000 "
12000 - 15000 "
BELOW 12000 "
5 0 5 10 15
Kms

FIG. 1.10

Irrigation by masonry wells in the different blocks of the District varies between 0.01 per cent in Jani Khurd block and 6.1 per cent in Khekra block. This is so mainly due to the fact that masonry wells are utilized only when other means of irrigation are not easily available. The area irrigated by other means of irrigation is very low, as may be seen from Table 1.5 and Fig. 1.10.

2.4. Industries

The Meerut District occupies an important place in the industrial economy of Uttar Pradesh. All type of industries, viz., large scale, small scale, cottage and village industry have developed in the District. It is well known its sugar industry, sports goods, cutlery, engineering equipments and other metal products. Vanaspati oil factories, cloth mills and other products have also developed in the study area. There are about 30 registered units of large scale industries in; the Meerut District giving employment to about 17361 peoples. Most of the industries are located in and around the urban areas. The important industries fall under large scale industries are sugar industry, vanaspati oil factories, cloth mills, chemical industry, paper mills, paints and varnishes, flour mills, engineering equipments and apparatuses, soaps, musical instruments and irrigation workshop.

There are many small scale industries in the Meerut District. It is clear from the Table 1.6 that Meerut Block has the highest number of small

Table 1.6
Meerut District: Distribution of Industrial Unit, 1990-91

S.No	Blocks	Large and medium scale Unit		Small Scale Units No. of Redg. Units	
		No. of Regd. Units	Employed persons in such units	In 1990	In 1970
1	Chhaprauli	--	--	8	--
2	Baraut	1	800	154	6
3	Baghpat	2	1095	14	5
4	Pilana	--	--	29	--
5	Khekra	--	--	90	3
6	Binauli	--	--	2	1
7	Saroorpur Khurd	--	--	1	--
8	Sardhana	--	--	126	4
9	Daurala	2	670	26	--
10	Mawana Kalan	1	598	54	5
11	Hastinapur	1	1010	14	--
12	Parikshitgarh	--	--	4	1
13	Machra	--	--	13	1
14	Rasulpur Rohta	--	--	--	--
15	Jani Khurd	--	--	1	1
16	Meerut	23	13188	1449	206
17	Rajpura	--	--	3	--
18	Kharkhauda	--	--	76	3
		30	17361		

scale industrial units in the study area. The major industries are of sports goods, cutlery, engineering equipments, agricultural Implements, metal goods, electric wires, cycles, ice and cold storage, gur and khandsari, flour and dal, calendaring, hosiery goods, fountain-pens, electrical goods, brushes, sewing machines, buttons, bandages, door fittings. Baraut occupies second place so far as the number of industrial units is concerned i.e., 154 units. Sardhana, Khekra, Kharkhauda, Mawana and Pilana blocks have 126,90, 76,54 and 29 such units respectively. Other blocks of the District, have less than 15 units. While Rasulpur Rohta block have not a single small scale industrial unit.

Cottage and village industries constitute Handloom cloth and *Khadi*, leather tanning and shoe making, Jaggery *Kolhu* oil. The other industries functioning in the rural areas of the District are those producing ghee, *biris*, silver and gold foil, lime, bricks, and tiles, *ban*, rope and *sutli*, mats, *chik*, *niwar*, blankets and cane chairs and stools etc. These products are sent to nearby markets for sale. Some of the products are also sent outside the District for the purpose.

2.5. Transport

Roads are of immense significance in modern times. They play a dominant role in the process of development in any area. There is no national highway passing through the District. The important state highways

passing through the District are Meerut Bareilly Road, Meerut Bulandshahr Road, Delhi Mussoorie Road and Baghpat Saharanpur Road. The total length of the state highways in the District is about 243 kilometres while that of metalled (*Pucca*) roads in 2356 kilometres. Out of which 1632 kilometres and 724 kilometres are in rural and urban areas respectively. The block wise distribution of metalled roads in the Meerut District has been given in Table 1.7.

It is clear from the table that Mawana block has the maximum length of 166 kilometres of metalled road followed by Daurala. Meerut, Baghpat and Binauli blocks having 156, 141,128 and 101 kilometres of metalled roads respectively. Parikshitgarh block has minimum length of 49 kilometres of metalled roads.

So far as the length of metalled roads per 100 thousand persons in the District is concerned, Meerut Block has the maximum length of 275 kilometres, followed by the blocks of Mawana Kalan, Daurala, Baghpat, Sardhana and Hastinapur with their respective road lengths of 138, 135.1, 99.7, 81.9 and 81.4 kilometres per 100,000 persons. Parikshitgarh block with 36.6 kilometres of metalled road, has the minimum facilities of metalled road in the study area.

Railways play an important role in the speedy development of the areas concerned. There are three broad gauge railway lines served by Northern Railways in the District. The section of the Northern Railway runs

Table 1.7
Meerut District: Transport Facilities, 1992-93

Blocks	Length of metalled Road			No. of bus stations/bus stops	No. of Railway stations
	Total	By P.W.D	On per lakh population		
Chhaprauli	89	75	74.8	12	--
Baraut	78	77	42.4	20	5
Baghpat	128	59	99.7	10	2
Pilana	82	76	63.8	12	--
Khekra	62	51	54.9	15	3
Binauli	101	95	59.6	18	--
Saroorpur Khurd	71	60	59.3	20	--
Sardhana	91	81	81.9	25	1
Daurala	156	65	135.1	14	1
Mawana Kalan	166	70	138.0	24	--
Hastinapur	77	73	81.4	25	--
Parikshitgarh	49	40	36.6	22	--
Machra	75	68	68.3	12	--
Rasulpur Rohta	62	55	61.5	24	--
Jani Khurd	75	60	60.8	15	--
Meerut	141	84	275.0	12	2
Rajpura	63	56	45.7	25	--
Kharkhauda	66	60	59.4	14	1
Total of the District (Rural)	**1632**	**1205**	**75.2**	**319**	**15**

Source: Compiled from statistical Magazine of District, Meerut, Institute State Planning, U.P., 1992-93.

from Ghaziabad Railway junction to the Meerut Railway junction. There are railway stations at Meerut city, Meerut cantonment, Daurala and Sakhrni. The second – a broad gauge runs form Meerut to Hapur and from there to Bulandshahr and Khurja. The third is also a broad gauge which cuts through the District in its journey from Shahdara to Muzaffarnagar and runs along the unmetalled road from Shahdara to Baghpat, Baraut and Shamli.

The transport network of the Meerut District has been given in Fig. 1.11.

2.6. Postal and Telecommunication Services

The Meerut District is well served with an extensive network of postal and telecommunication services. There were 276 post offices located in its rural areas during 1993-94.

It is clear from the Table 1.8 that Baraut block has the highest number of 29 post offices followed by Binauli (26), Baghpat (22) and Mawana Kalan (18), while Meerut and Khekra blocks have only 9 offices each.

There is not a single telegraph office in rural areas of Meerut District. The District has 100 public call offices in rural areas only while the telephone connections in the rural areas of the District are 681. The positions of total means of communication has been shown in Table 1.8.

2.7. Rural Markets

Rural markets continues to play an important role in the development

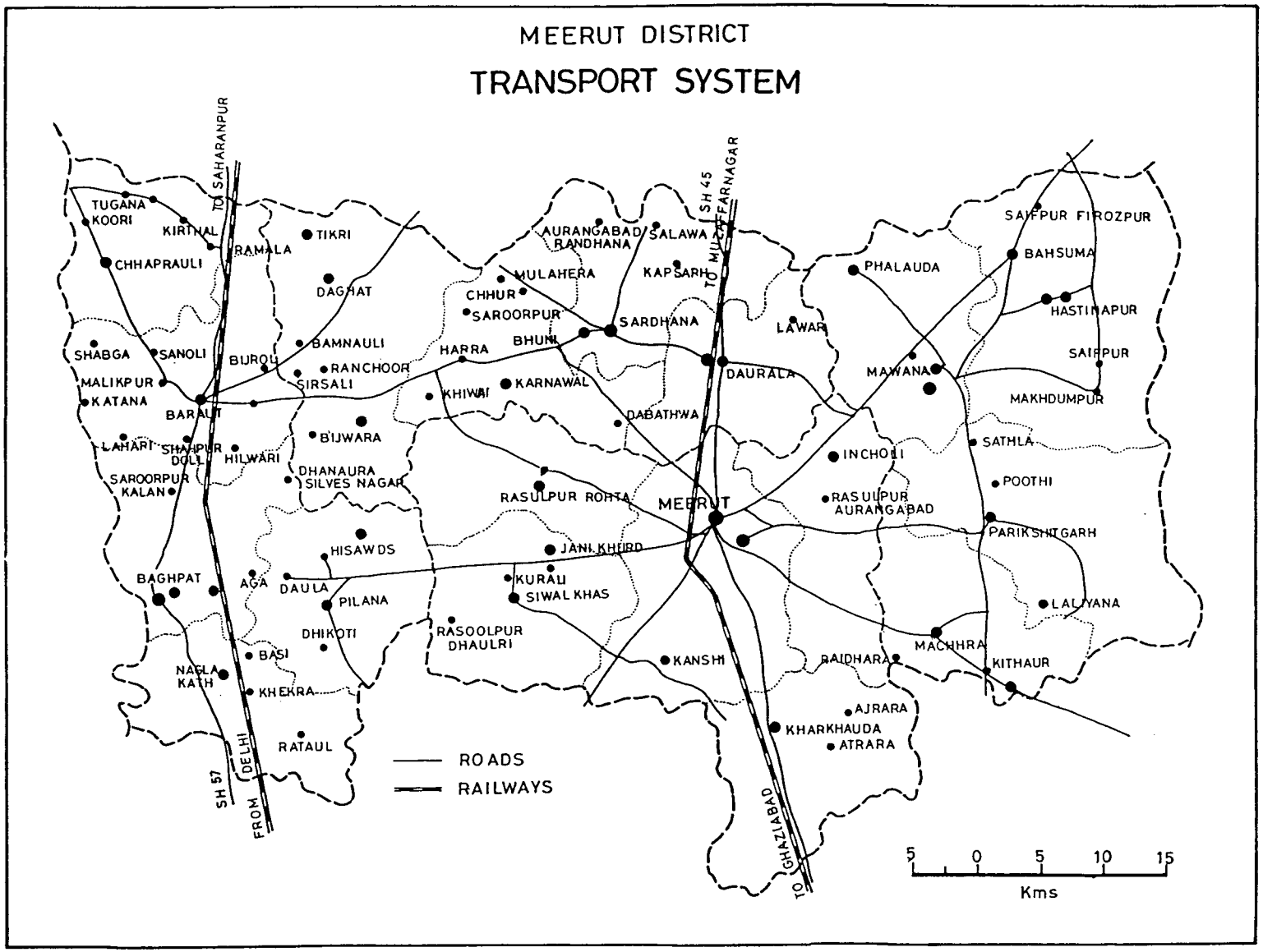

MEERUT DISTRICT
TRANSPORT SYSTEM
TO SAHARANPUR
TO MUZAFFARNAGAR
SH 45
TUGANA KOORI
KIRTHAL
RAMALA
TIKRI
CHHAPRAULI
DAGHAT
AURANGABAD BANDHANA
SALAWA
MULAHERA
KAPSARH
CHHUR
SAROORPUR
SARDHANA
PHALAUDA
SAIFPUR FIROZPUR
BAHSUMA
HASTINAPUR
LAWAR
SAIFPUR
SHABGA
SANOLI
BIJROL
BAMNAULI
RANCHOOR
SIRSALI
HARRA
BHUNI
DAURALA
MAWANA
MALIKPUR
KATANA
BARAUT
KHIWAI
KARNAWAL
DABATHWA
MAKHDUMPUR
LAHARI
SHAHPUR DOLI
HILWARI
BIJWARA
INCHOLI
SATHLA
SAROORPUR KALAN
DHANAURA SILVES NAGAR
RASULPUR ROHTA
MEERUT
RASULPUR AURANGABAD
POOTHI
PARIKSHITGARH
HISAWDS
JANI KHURD
BAGHPAT
AGA
DAULA
PILANA
KURALI
SIWAL KHAS
LALIYANA
DHIKOTI
RASOOLPUR DHAULRI
MACHHRA
BASI
KANSHI
RAIDHARA
KITHAUR
NAGLA KATH
KHEKRA
AJRARA
KHARKHAUDA
ATRARA
RATAUL
SH 57
FROM DELHI
TO GHAZIABAD
ROADS
RAILWAYS
5 0 5 10 15
Kms

FIG. 1-11

Table 1.8
Meerut District: Means of Communication in Rural Areas, 1992-93

Blocks	No. of Post offices	No. of Telegraph offices	No. of Telephone Connections	No. of Public Call offices
Chhaprauli	10	--	26	1
Baraut	29	--	29	2
Baghpat	22	--	36	2
Pilana	16	--	38	1
Khekra	9	--	54	1
Binauli	26	--	41	1
Saroorpur Khurd	15	--	61	1
Sardhana	15	--	22	1
Daurala	10	--	22	1
Mawana Kalan	18	--	25	1
Hastinapur	11	--	26	1
Parikshitgarh	15	--	27	1
Machra	16	--	19	1
Rasulpur Rohta	14	--	39	2
Jani Khurd	13	--	67	1
Meerut	9	--	93	79
Rajpura	12	--	29	2
Kharkhauda	16	--	27	1
	276	--	681	100

Source: Compiled from statistical Magazine of District, Meerut, Institute State Planning, U.P., 1992-93.

of an area. These markets are locally called *hats* or *painths*. These are periodic market held weekly in various villages. These local markets serve the surrounding area and commodities such as food grains, vegetables, fruits, spices, cloths, etc. are sold here. A majority of farmers unload their farm produce at these local markets for sale.

A large majority of weekly markets are held in villages of above 500 population size. Parikshitgarh Block has a highest number of 13 villages holding weekly markets, followed by Machra and Rasulpur Rohta blocks with 12 villages each, holding such local markets. The areal distribution of these villages markets has been shown in Fig. 1.12.

3. DEMOGRAPHIC SETTING

Population play an important role in determining the nature of human settlements in terms of size and economy. The layout of the settlements and their vertical and horizontal growth are the direct outcome of the size of population, its pressure and density. Therefore, an attempt has been made here to discuss the demographic characteristics of the study area.

3.1. Population Growth

A perusal of the population figures of the study area indicates that since 1901 census there has been a steady population growth in the District, the only exception being the period between 1901-1921, when it registered a negative growth. This negative growth is attributed to the fact

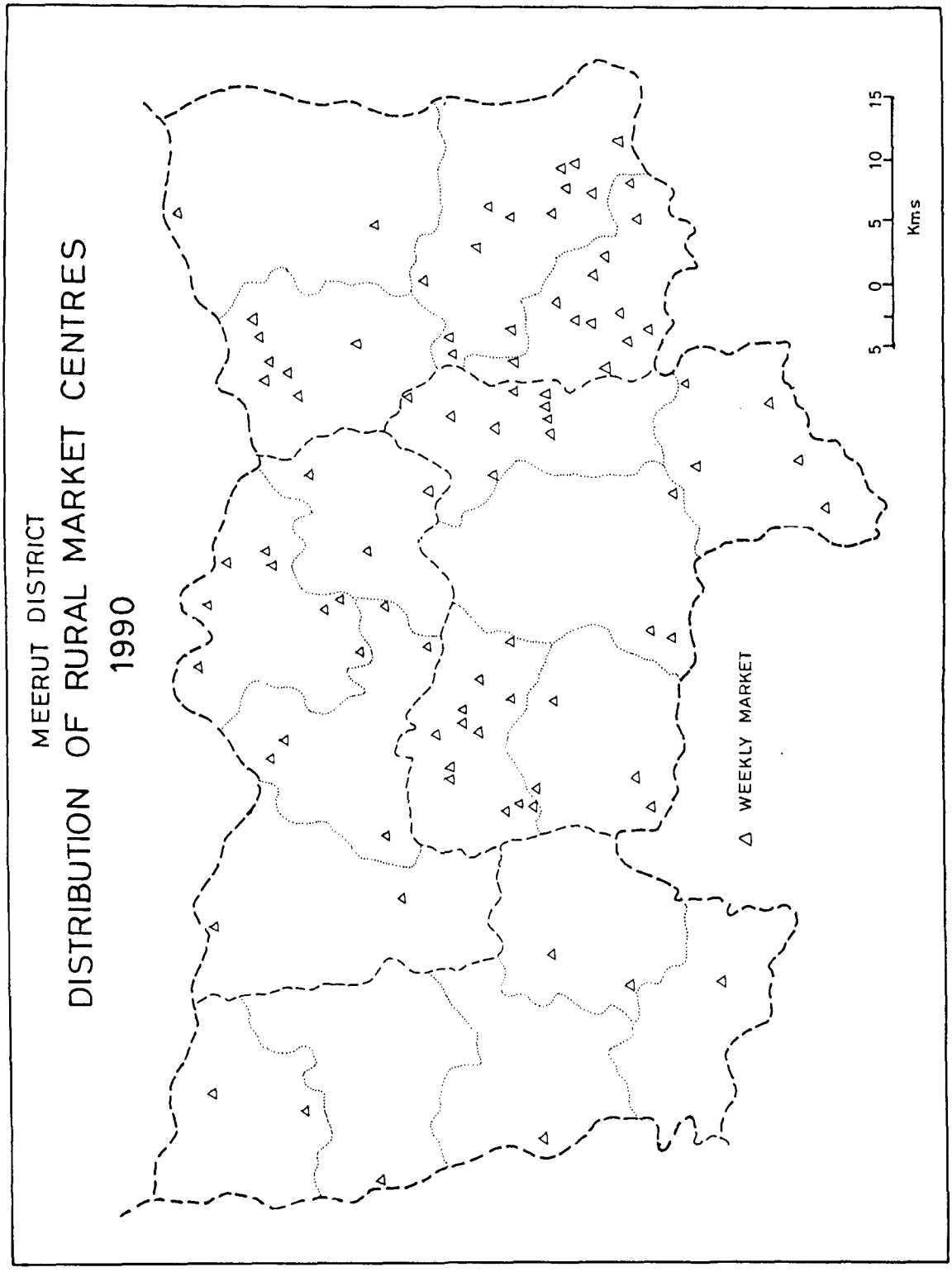

MEERUT DISTRICT
DISTRIBUTION OF RURAL MARKET CENTRES
1990
WEEKLY MARKET
5 0 5 10 15
Kms

FIG.1.12

that during this period India suffered from a number of serious natural calamities, like the famine of 1897 which resulted in a reduction in birthrate. The population growth shows two discernible trends, a decreasing population trend till 1921, and a continuous increase since 1921. During 1901-1911, the population decreased by 1.35% and in the next decade, 1911-1921 there was a further decline in population by 0.31%. The decade saw a slight increase in the death rate resulting in decline in population. Since 1921 the population has been increasing continuously, and so this year is known as great divide in Indian demography to denote between the decreasing and the increasing trend. The decade ending in 1931 exhibited a growth rate of 6.88% which increased to 18.39% in 1941. The trend of increase of population in successive decades has been given in Table 1.9, which reveals that population growth has been following a sigmoid (s-shaped) curve, representing a rapid increase in population Fig. 1.13.

It is clear from the Table that the study area recorded a growth rate of 21.28% during 1961-71 and 25.34% during 1971-81. As a result of increased health care the mortality rate has gone down and the family planning measures have not been able to control the growth in population. During the last decade 1981-91 there is an increase in population by 24.59%.

It has been observed that the growth rate of urban population has always been higher than that in rural areas. This is mainly due to the

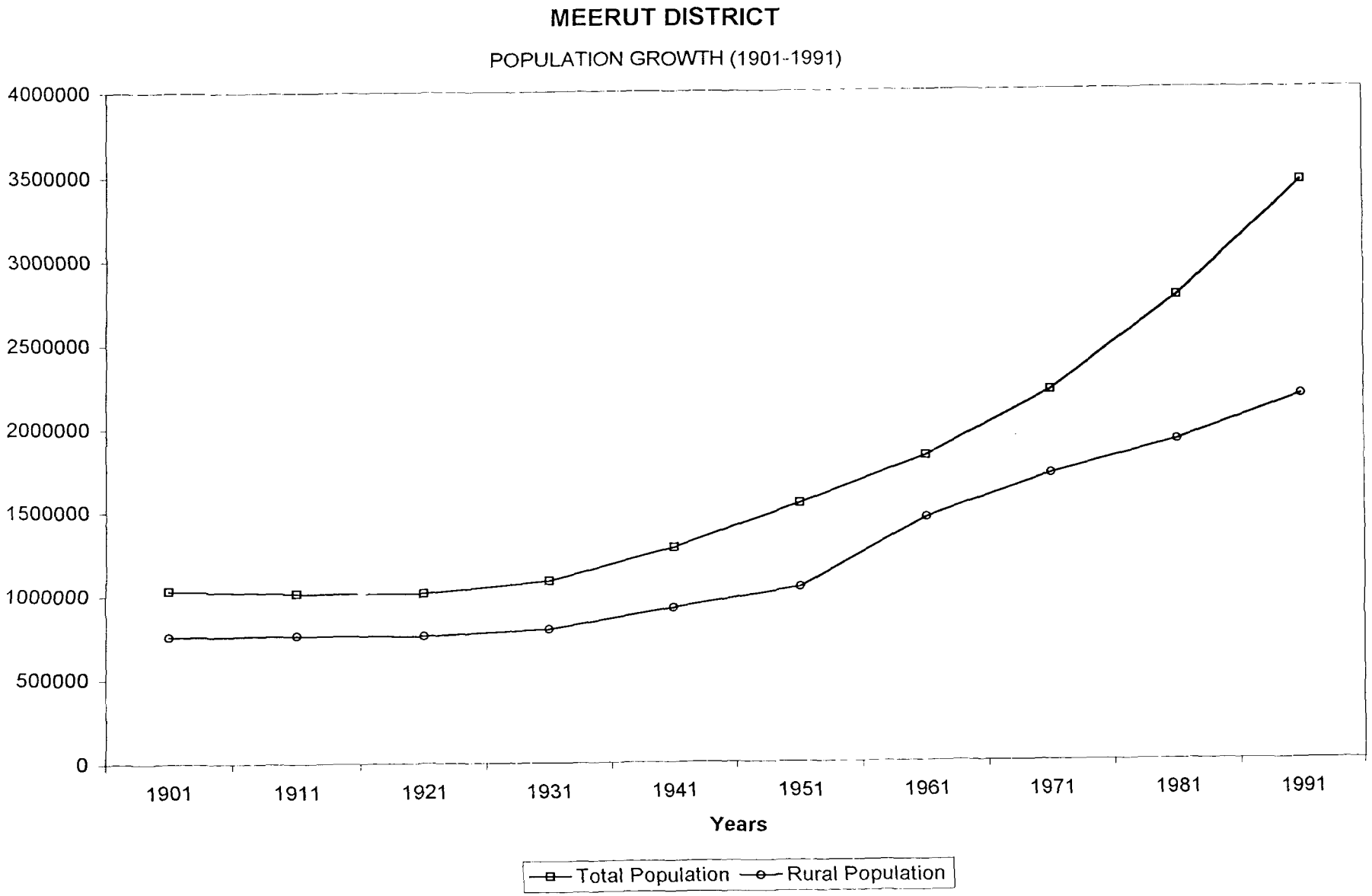

MEERUT DISTRICT
POPULATION GROWTH (1901-1991)
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
1901
1911
1921
1931
1941
1951
1961
1971
1981
1991
Years
Total Population
Rural Population

FIG.1.13

TABLE 1.9
Population Growth (1901-1991)

Census year	Total person population		Decennial percentage variation	Rural population		Decennial percentage variation	Urban Population		Decennial Percentage variation
	Persons	Decennials		Persons	Decennials		Persons	Decennials	
1901	1028852	--	--	753877	--	--	274975	--	--
1911	1014948	-13904	-1.35	761270	+7393	0.98	253678	-21297	-7.74
1921	1011799	-3149	-0.31	754673	-6597	0.87	257126	+3448	+1.36
1931	1081466	+69667	+6.88	792873	+38200	5.06	288593	+31467	+12.24
1941	1280395	+198929	+18.39	919030	+126157	15.91	361365	+72772	+25.22
1951	1540065	+259670	+20.28	1040389	+121359	13.20	499676	+138311	+38.27
1961	1820404	+280339	+18.20	1450842	+410453	39.45	369562	-130114	-26.04
1971	2207877	+387473	+21.29	178090	+257248	17.73	499787	+130225	+35.24
1981	2767246	+559369	+25.34	1903280	+195190	11.43	862966	+364179	+72.87
1991	3447912	+680666	+0.25	2171355	+268075	14.08	1276557	+412591	+47.75
(1901-1981)			+235.12			+188.04			+364.24

Source: Compiled from district census Handbook of (1961, 1971, 1981 and 1991).

addition of several small rural agglomerations of the Meerut District which were transferred to the category of towns in 1991 census Table 1.10.

Table 1.11 shows block level growth of population in the rural areas of the Meerut District during 1981-91. According to this, these blocks may be classified into three categories:

(a). Low Growth Blocks (<10%), which was confined to four blocks.
(b). Medium Growth Block (10-20%), covering nine blocks of the study area.
(c). High Growth Blocks (>20%) are five in number.

3.2. Distribution of Population

The pattern of population is influenced by the physico-cultural factors of the area. The chief factors controlling the distribution of population in the study area are topography, climatic conditions, fertility of the land and water availability. While the main cultural factors are agriculture, irrigational facilities, industries, accessibility and means of communication. The size of population determines the nature and pattern of human settlement, while its distribution shows the nature of man's adjustment with physical resources. Fig.1.14 shows the general pattern of population distribution in the Meerut District during 1991 and reveals that, by and large, the distribution of population is more or less homogenous, as the study area lies in an area which has hardly any physical variations. However, at the micro level variation in population distribution are clearly

Table 1.10
Population of Urban Areas Classified in 1991 Census

S.No.	Town / City / UA	Population 1991	Growth rate 1981-91
1	Meerut UA	846954	49.11
2	Meerut MC	752078	67.58
3	Meerut Cantt	94876	0.71
4	Baraut MB	67673	46.19
5	Mawana MB	51644	37.28
6	Sardhana MB	42969	42.57
7	Khekra TA	35014	40.15
8	Baghpat MB	24918	45.24
9	Kithore TA	19279	39.79
10	Chhaprauli TA	15944	15.49
11	Hastinapur TA	15081	29.60
12	Lawar TA	14468	25.43
13	Siwal Khas TA	14400	40.11
14	Phalauda TA	13955	35.13
15	Parikshitgarh TA	13675	20.72
16	Tikri TA	12707	12.30
17	Shahjahanpur CT	12443	40.33
18	Doghat TA	12310	22.87
19	Karnawal TA	11040	11.57
20	Agarwalmandi TA	10802	15.49
21	Kharkhauda TA	10549	21.14
22	Daurala TA	9716	--
23	Behsuma TA	8942	13.10
24	Aminagar Sarai TA	8249	20.65

Source: Compiled from District Census Handbook, Meerut, 1991.

Table 1.11

Block-wise Growth of Rural Population 1981-91

S.No.	Blocks	Rural population		Decennial variation in percent (1981-91)
		1981	1991	
1	Chhaprauli	100491	118932	18.350
2	Baraut	159446	183945	15.365
3	Baghpat	98372	128393	30.517
4	Pilana	118493	128606	8.534
5	Khekra	87352	112969	29.326
6	Binauli	148546	169473	14.087
7	Saroorpur Khurd	100825	119667	18.687
8	Sardhana	97348	111116	14.143
9	Daurala	148722	115481	-22.351
10	Mawana Kalan	103889	120274	15.771
11	Hastinapur	75534	94567	25.197
12	Parikshitgarh	111445	133961	20.203
13	Machra	93590	109784	17.303
14	Rasulpur Rohta	96610	100759	4.294
15	Jani Khurd	105148	123334	17.295
16	Meerut	90811	51277	-43.534
17	Rajpura	117994	137793	16.779
18	Kharkhauda	88664	111024	25.218

Source: Compiled from District Census Handbook, Meerut, 1991.

Table 1.12
Density of Rural Population (1991)

S.No.	Blocks	Area in Sq.Km.	Population	Density in person/Km
1	Chhaprauli	182.0	118932	653
2	Baraut	235.8	183945	780
3	Baghpat	187.0	128393	686
4	Pilana	203.6	128606	632
5	Khekra	162.7	112969	694
6	Binauli	297.9	169473	569
7	Saroorpur Khurd	204.4	119667	585
8	Sardhana	186.3	111116	596
9	Daurala	189.2	115481	610
10	Mawana Kalan	221.6	120274	543
11	Hastinapur	349.4	94567	271
12	Parikshitgarh	318.7	133961	420
13	Machra	185.6	109784	591
14	Rasulpur Rohta	154.5	100759	652
15	Jani Khurd	175.6	123334	702
16	Meerut	72.1	51277	711
17	Rajpura	163.9	137793	841
18	Kharkhauda	197.4	111024	562
		3687.8	**2171355**	**589**

Source: Compiled from District Census Handbook, Meerut, 1991.

discernible. For instance in the low lying and unproductive tracts of the Yamuna and Ganga Khadar, the population is unevenly distributed whereas in the middle zone, a number of large size agglomerations have over 5000 people each.

3.3. Density of Population

The population density gives a relative picture of the population distribution in a region and provides an idea of the population pressure upon the resource base. It varies according to the units of measurement and gives different values for different categories of land use. Blocks have been taken as units in the present study for the purpose of examining the regional variations in population density in the Meerut District.

According to the 1991 census the rural population density of the District is 588 persons per sq. km., which is much higher than national average (267 persons per sq. km.). There are considerable variations in the density pattern among various blocks due to differences in soil fertility and prevailing environmental conditions. Table 1.12 shows the pattern of density in different blocks of the study area. On the basis of calculated densities, the blocks of the Meerut District may be grouped into five categories Fig. 1.15.

i. Areas of very Low Density (below 300 persons per sq. km.): This area comprise only one block, namely Hastinapur, the density of which is the very lowest in the District.

Table 1.13
Meerut district Rural Occupational Structure
1992-93

Block	Non-Workers	Cultivators	Agricultural Labourer	Household Industry	Marginal workers	Total Population in figure
Chhaprauli	71.58	14.45	9.45	0.37	3.65	113348
Baraut	71.64	14.48	9.61	0.62	3.64	172638
Baghpat	67.88	16.41	8.92	0.49	6.28	118169
Pilana	71.41	14.47	8.89	0.91	4.31	120708
Khekra	76.09	14.08	6.43	0.44	2.95	100070
Binauli	72.83	15.08	7.99	0.70	3.38	159532
Saroorpur Khurd	70.23	15.36	8.95	0.83	4.61	113175
Sardhana	75.94	14.61	7.98	0.86	0.61	103321
Daurala	75.52	12.09	8.87	0.84	2.67	104958
Mawana Kalan	70.78	14.78	10.47	0.55	3.41	113100
Hastinapur	68.43	17.64	8.73	0.72	4.47	89131
Parikshitgarh	71.92	16.75	8.63	0.39	2.31	126730
Machra	73.35	15.89	8.27	0.27	2.22	103391
Rasulpur Rohta	75.48	13.24	9.66	0.49	1.13	93109
Jani Khurd	74.95	11.26	9.34	0.59	3.84	112672
Meerut	78.23	11.17	8.19	0.85	1.55	45508
Rajpura	78.74	11.18	8.26	0.33	1.48	123690
Kharkhauda	71.48	14.65	9.75	0.36	3.75	104649

Source: Compiled from statistical Magazine of District, Meerut, Institute State Planning, U.P., 1992-93.

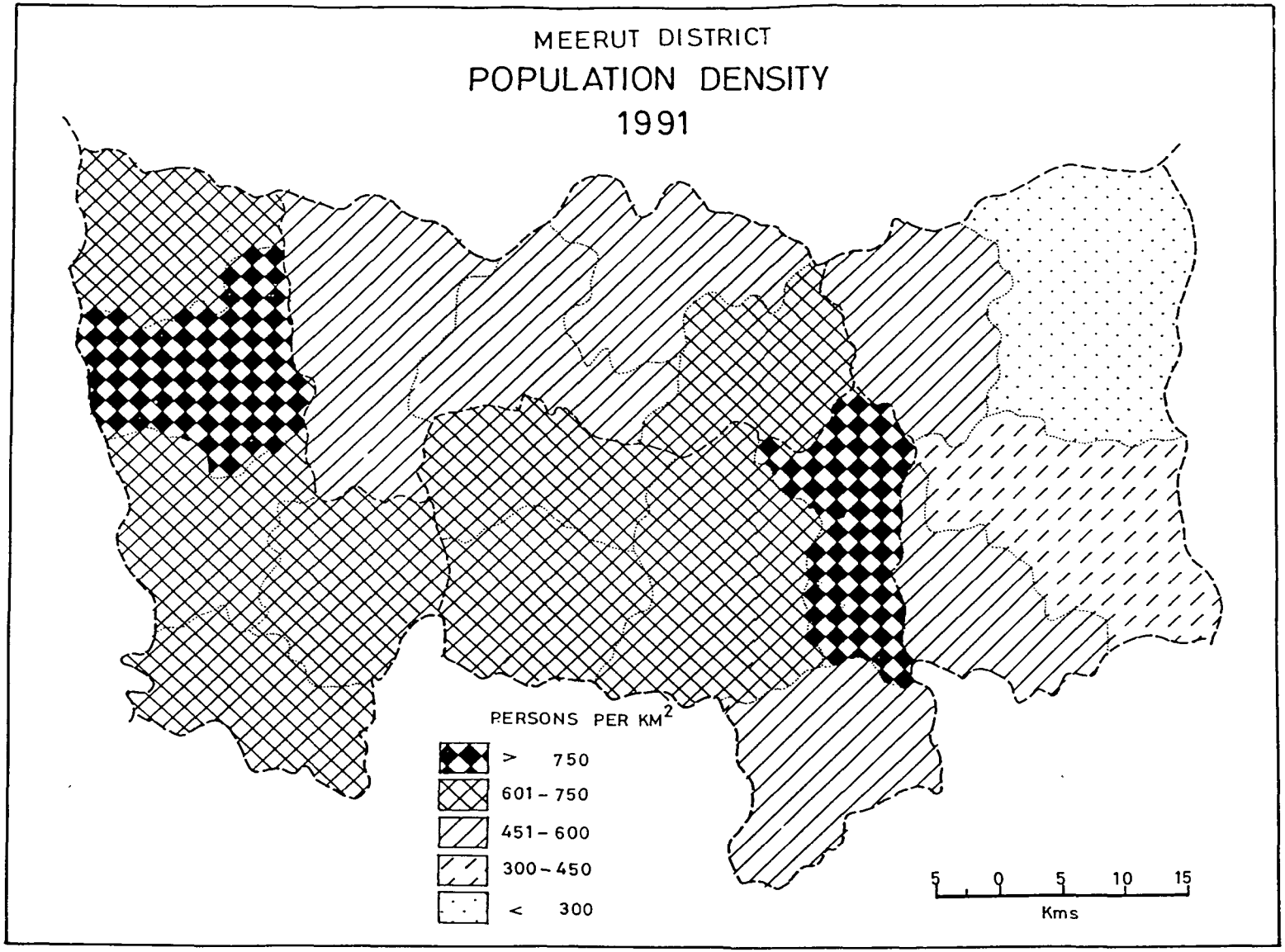

MEERUT DISTRICT
POPULATION DENSITY
1991
PERSONS PER KM²
> 750
601 - 750
451 - 600
300 - 450
< 300
5 0 5 10 15
Kms

FIG. 1.15

ii. Areas of Low Density (301-450 persons per sq km.): Only one block i.e., Parikshitgarh falls in this category.

iii. Areas of Medium Density (451-600 persons per sq. km.): There are six block in the District with moderate density, e.g., Binauli, Saroorpur Khurd, Sardhana, Mawana Kalan , Machra and Kharkhauda.

iv. Areas of High Density (601-750 persons per sq. km.): Chhaprauli, Baghpat, Pilana, Khekra, Daurala, Rasulpur Rohta, Jani Khurd and Meerut are the eight blocks of the District which have high density of population.

v. Areas of very High Density (Above 750 persons per sq. km.): The very highest density of population in the study area is found in Rajpura (841) followed by Baraut (780) persons per sq. km.

It is clear from the foregoing discussion that the Meerut District is an area of relatively high density of Population. The only exceptions are the regions which are either agriculturally unproductive or lie in the flood plains of rivers.

Apart from an analysis of the distribution and density of population, it is equally important to study its physical and cultural characteristics as well. Among the physical characteristics, age and sex structure are important,

while literacy level, marital status and occupational structure are significant cultural traits.

3.4. Occupational Structure of Rural Populaiton

The structure of rural occupation of a population affects the several socio-cultural and demographic characteristics of an area in a number of ways. It reflects the nature and trend of economy of a region. In the study area, 29.24% of rural population consists of main workers, of which 74.96%, engaged in primary sector (cultivators, agricultural labourers, mining, quarrying, livestock, forestry, fishing , hunting and plantation). About 69.57% males and 5.38% females are engaged in primary sector, while 11.3% peoples are engaged in secondary sector, of which 10.33% and 0.96% are males and females respectively. Lastly 13.73% peoples are found in tertiary sector, out of which 13.23% are males and 0.49% are females. Table 1.13 shows the normal occupational structure of rural population in the study area. The occupational structure of the rural population by sex is given in Table 1.14. Among the total peoples working in primary sector, the majority of people constitutes cultivators and agricultural labourers which accounts about 98.68%. Fig. 1.16 exhibits the normal occupational structures of the study area.

3.5. Age and Sex Structure

Age and Sex structure is an important indicator of the potential labour supply and trends of the growth of the population. The age-sex

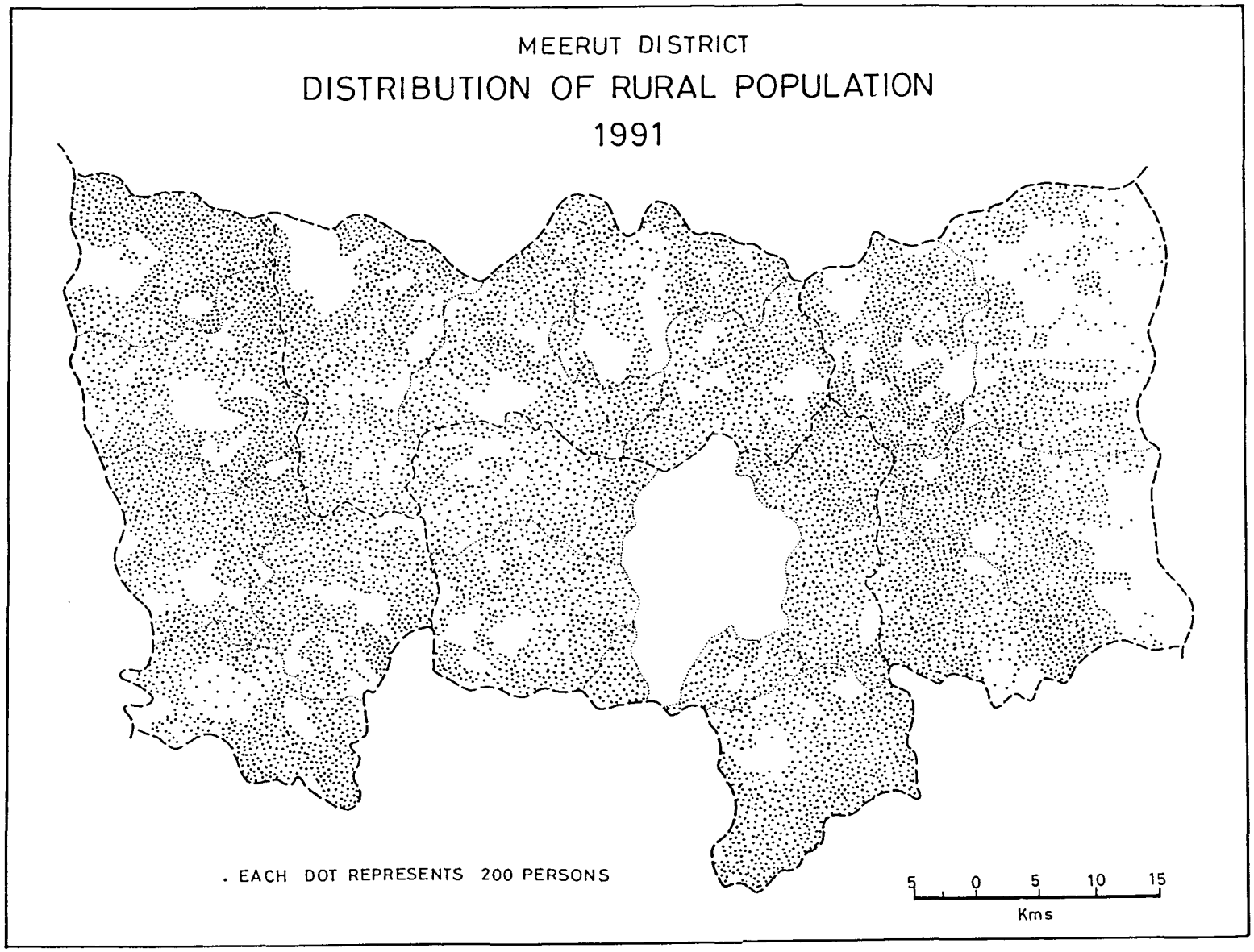

MEERUT DISTRICT
DISTRIBUTION OF RURAL POPULATION
1991
. EACH DOT REPRESENTS 200 PERSONS
5 0 5 10 15
Kms

FIG. 1.14

Table 1.14
Occupational Structure of Rural Population by Sex (1991)

Occupation	Total	Male	Female	Percentage of workers		
				Total	Male	Female
Primary Sector						
1. Cultivators	290947	274938	16009	45.82	43.29	2.52
2. Agricultural labourers	178800	161782	17018	28.16	25.48	2.68
3. Livestock, Forestry, Fishing, Hunting and Plantation	6231	5084	1147	0.98	0.80	0.18
4. Mining and Quarrying	63	61	2	0.0099	0.0096	0.0003
Secondary Sector						
5. Household Industry	11804	10155	1649	1.86	1.59	0.26
6. Other than Household Industry	51112	46690	4422	8.05	7.35	0.69
7. Constructions	8882	8843	39	1.39	1.39	0.006
Tertiary Sector						
8. Trade and Commerce	22604	22158	446	3.56	3.49	0.070
9. Transport, Storage and Communication	10728	10690	38	1.69	1.68	0.006
10. Other services	53841	51169	2672	8.48	8.06	0.42
	635012	591570	43442	100.00	93.1396	6.8323

Source: Compiled from District Census Handbook, Meerut, 1991.

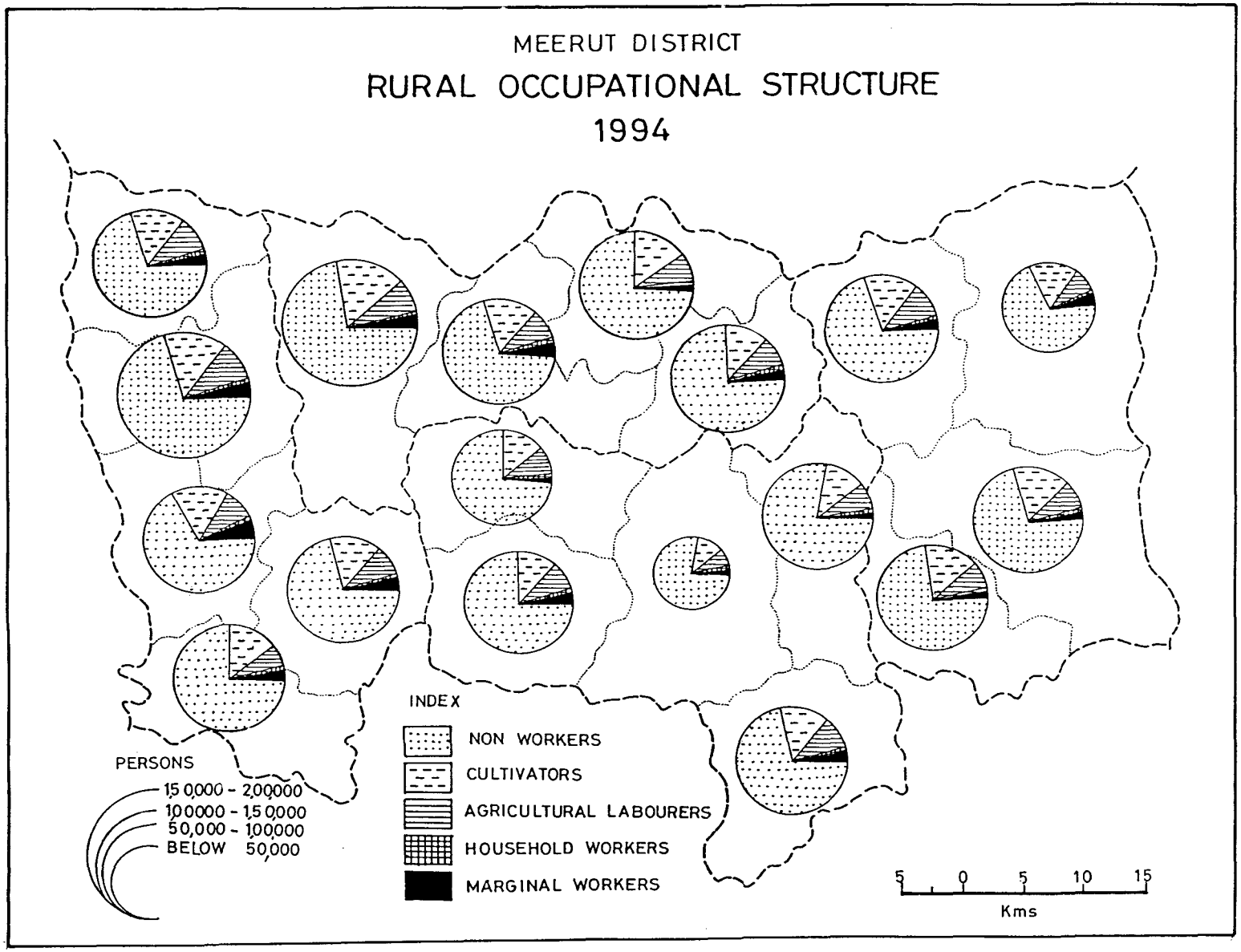

MEERUT DISTRICT
RURAL OCCUPATIONAL STRUCTURE
1994
INDEX
NON WORKERS
CULTIVATORS
AGRICULTURAL LABOURERS
HOUSEHOLD WORKERS
MARGINAL WORKERS
PERSONS
1,50,000 - 2,00,000
1,00,000 - 1,50,000
50,000 - 1,00,000
BELOW 50,000
5 0 5 10 15
Kms

FIG. 1.16

structure in the study area can be constructed either by using the absolute number of both the sexes in different age groups or by using percentages representing the proportion of males and females in each group within the total population. Fig. 1.17 shows the pyramid of age-sex structure which has a broad base and narrows quickly upwards, is young and highly fertile population. Table 1.15 shows that the proportion of population goes on decreasing downwards.

The Table 1.15 indicates that (40.41%) of the total rural population is in the working age group, 20-60 years. The corresponding proportion among males is 39.33% which is considerably lower than that among females (41.68%). The main factor which is responsible for this difference is the migration. Lack of job opportunities and heavy pressure of population on land usually leads to large number of migrations.

The ratio of females per 1000 of male population in the District was 855 in 1991. Sex ratio in the District has been fluctuating from decade to decade as shown in Table 1.16.

The marital status of a population refers to the proportions of single, married, widowed and divorced people. Both age structure and sex ratio influence these proportions. The District has relatively more 'never married' males than females. But the population of married males (21.35%) and married females (21.07%) are almost equal. This can be due to the fact that

Table 1.16
Sex Ratio (Number of Females per 1000 males)

S.No.	Census Year	Number of Females per 1000 males
1	1901	876
2	1911	848
3	1921	851
4	1931	839
5	1941	848
6	1951	837
7	1961	843
8	1971	831
9	1981	830
10	1991	855

Source: Compiled from District Census Handbook, Meerut, 1951, 61,71,81, 91.

Table 1.15
Age-Sex Structure (1991)

Age Group		Total Rural Population			
All ages	%age of total rural population	Male		Female	
		1039429	%	863552	%
0-4	13.40	131969	12.69	123106	14.25
5-9	14.99	156480	15.05	128916	14.92
10-14	14.22	150873	14.51	119735	13.86
15-19	9.69	107719	10.36	76611	8.87
20-24	7.97	81530	7.84	70092	8.12
25-29	6.52	65405	6.29	58600	6.78
30-34	5.60	55514	5.34	51146	5.92
35-39	4.91	48725	4.68	44743	5.18
40-44	4.70	47701	4.59	41798	4.84
45-49	4.13	40354	3.88	38217	4.42
50-54	3.91	43380	4.17	31019	3.59
55-59	2.67	26419	2.54	24433	2.83
+60	7.28	83360	8.02	55136	6.38
Total	100.00		100.00		100.00

Source: Compiled from District Census Handbook, Meerut, 1991.

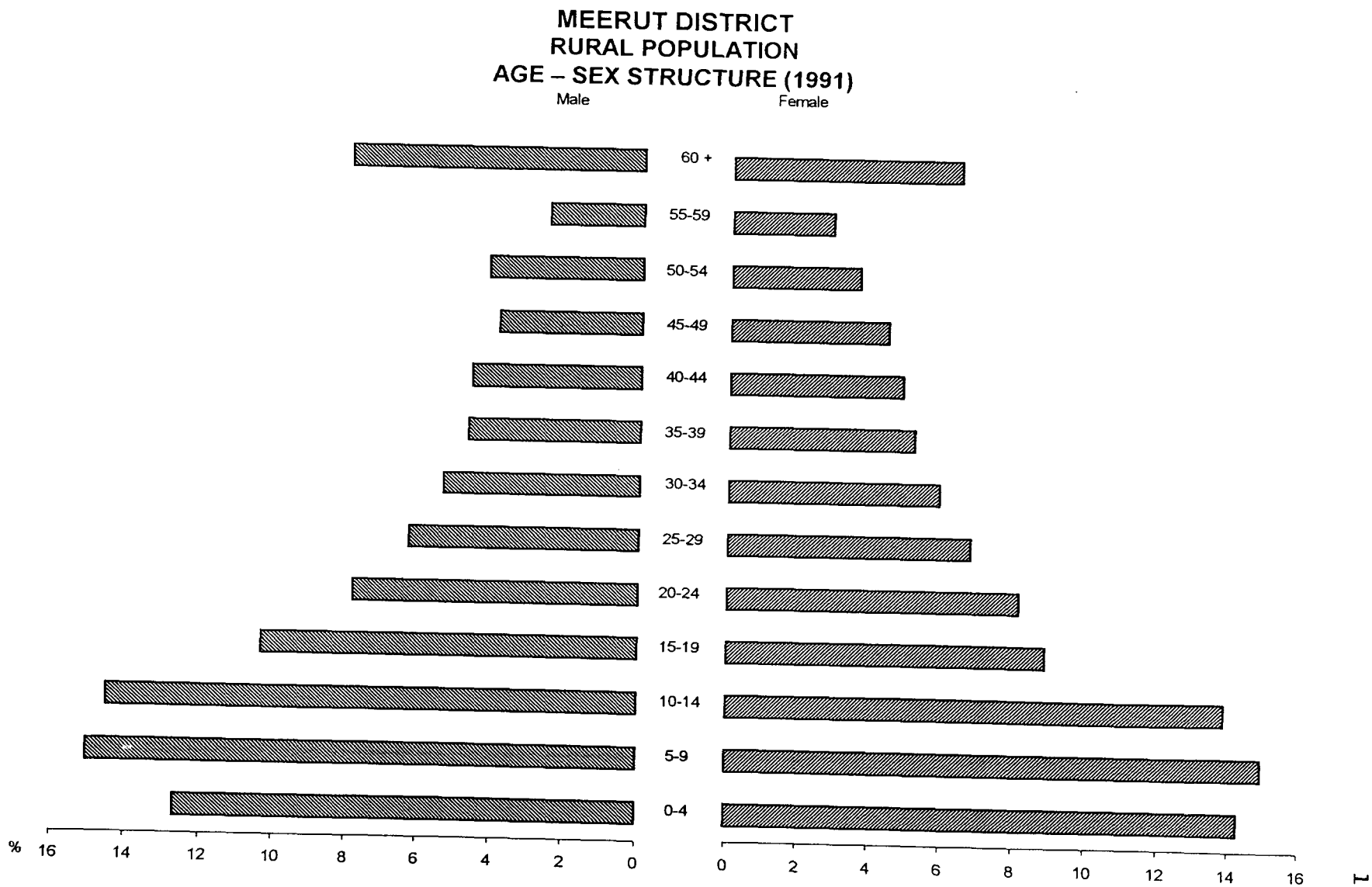

MEERUT DISTRICT
RURAL POPULATION
AGE – SEX STRUCTURE (1991)
Male
Female
60 +
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
%
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16

FIG. 1.17

the girls marry at much younger ages than boys. As against 31.23% of males in the District who had not married at all, the corresponding proportion among females is 23.31% only.

It is notable that the incidence of child marriages in the District is not very frequent. In comparison to male, child marriage is relatively higher in females. The table reveals only 13.76% of females in the age group of 15-34 belonged to the category of never married. The corresponding proportions among males is quite high i.e., 26.26%.

As the table clearly shows divorce is not much prevalent in the study area. The proportion of widows are higher than that of widowers because of the restrictions prevalent among the Hindus on widow remarriage. The marital status by age groups in the District is given in Table 1.17.

3.6. Literacy

As from 1991 census the study area constitute only 51.3 per cent literacy. The proportion of literates among males was higher (64.5%) than that of females (35.6% The percentage of literates are lower in rural areas (46.4%) than in urban areas (59.4%). Table1.18 shows the pattern of literacy which reveals that highest percentage of literates in the District was in Mawana Kalan (52.3%) followed by Sardhana Block (51.8%), while Kharkhauda Block recorded the lowest percentage of literates (39.2%) in the study area.

Table 1.17
Marital Status and Age Sex Structure In Percentage

Marital status	Never married		Married		Widowed		Divorced or separated	
	Male	Female	Male	Female	Male	Female	Male	Female
0-14	614666 (71.17)	531402 (86.13)	1777 (0.30)	3712 (0.64)	20 (0.04)	20 (0.03)	10 (0.69)	5 (0.56)
15-34	226766 (26.26)	84899 (13.76)	245533 (41.59)	305093 (52.37)	2979 (6.09)	2499 (4.12)	629 (43.32)	366 (40.94)
35-59	16075 (1.86)	502 (0.08)	265227 (44.93)	232680 (39.94)	17598 (35.95)	22741 (37.48)	563 (38.77)	361 (40.38)
+60	6146 (0.71)	195 (0.03)	77817 (13.18)	41118 (7.06)	28350 (57.92)	35414 (58.37)	250 (17.22)	167 (18.68)
Total	863653 (31.23)	616998 (22.31)	590354 (21.35)	582603 (21.07)	48947 (1.77)	60674 (2.19)	1452 (0.05)	894 (0.03)

Source: Compiled from District Census Handbook, Meerut, 1991.

Table 1.18
Block-wise Figures of Literate Persons and Literacy Percentage (1991)

S.No.	Blocks	Literate Person			Literacy Percentage		
		Male	Female	Total	Male	Female	Total
1	Chhaprauli	31647	11238	42885	60.1	26.1	44.8
2	Baraut	49745	18260	68005	60.8	27.5	45.9
3	Baghpat	37031	13828	50859	65.2	30.1	49.5
4	Pilana	33327	12508	45835	60.3	26.8	44.9
5	Khekra	31977	11807	43784	65.2	29.4	49.1
6	Binauli	47718	17301	65019	63.8	28.2	47.8
7	Saroorpur Khurd	27886	10795	38681	54.3	25.1	41.0
8	Sardhana	32598	13408	46006	67.7	33.0	51.8
9	Daurala	31678	11976	43654	63.3	28.6	47.5
10	Mawana Kalan	36518	14087	50605	69.0	32.1	52.3
11	Hastinapur	25218	8369	33587	61.4	24.6	44.7
12	Parikshitgarh	32592	10528	43120	56.1	22.0	40.7
13	Machra	28080	9842	37922	59.9	24.9	43.9
14	Rasulpur Rohta	29207	11723	40930	66.7	32.2	51.0
15	Jani Khurd	35898	13844	49742	67.4	31.0	50.8
16	Meerut	13158	4461	17619	59.9	24.7	44.0
17	Rajpura	35826	13276	49102	61.2	27.1	45.6
18	Kharkhauda	25684	8456	34140	53.4	21.6	39.2
	Rural	585788	215707	801495	62.0	27.6	46.4
	Urban	379950	232732	612682	68.6	48.8	59.4
	Total	965738	448439	1414177	64.5	35.6	51.3

Source: Compiled from District Census Handbook, Meerut, 1991.

3.7. Religious Composition

Among the various social characteristics of a population, religion is important, in the sense that it influences various types of demographic behaviour. The religions composition of the Meerut District is given in Table 1.19. Like other areas of Uttar Pradesh, Meerut District is also dominated by Hindus (72.83%), followed by Muslims (25.30%), Christians, (0.36%) and Sikhs (0.24%). The population of Christian and Sikhs are more concentrated in urban areas than in rural areas.

3.8. Language

Language is also a basic cultural characteristics of a population. The Table 1.20 shows that about 79.74 per cent of the people spoken Hindi as their mother tongue. It is followed by Urdu (19.28%), Punjabi (0.49%), Bengali (0.03%) and others (0.06%).

The dialect spoken in the District is Khariboli or western Hindi which has evolved from the Prakrit and Apabhransha spoken in these parts in the pre-medieval period. Into the Khariboli spoken in Meerut District have crept words and forms from Braj Bhasha, Punjabi, Rajasthani, Urdu, Persian and English. The dialects used in tehsil Baghpat by the Jats is termed Deswall and that spoken by the Gujars. The speech of the educated people in the urban areas of District is generally Khariboli with an occasional intermixture of Persian and English words.

Table 1.19
Religion wise Population

S.No.	Religion	Total	Rural	Urban	% of total population
1	Hindu	2015475	1460323	555152	72.83
2	Muslim	700144	425510	274634	25.30
3	Christian	9938	1225	6713	0.36
4	Sikh	6597	1300	5297	0.24
5	Others	35092	14922	20170	1.27
	Total	2767246	1903280	863966	100.00

Source: Statistical Bulletin of Meerut District (1992-93)

Table 1.20
Language wise Population

S.No.	Language	Total	% of total Population
1	Hindi	2206674	79.74
2	Urdu	533482	19.28
3	Punjabi	13466	0.49
4	Bengali	736	0.03
5	Others	1549	0.06
		2755906	100.00

Source: Statistical Bulletin of Meerut District (1992-93)

3.9. Caste and Social Stratification

The institution of caste has been one of the exclusive characteristics of the Indian society since early ages, in spite of great changes in the history of India. Caste has continued to be an important feature of an Indian social life. Caste play an important role in determining the site of a rural habitation. According to Manu -the ancient law giver of Hindu religion the Brahmins was born from the mouth of supreme being and was assigned to recite Vedas, the Kshatriya from his arms, the Vaishyas from his thighs and the Shudras from his feet. The Brahmins evidently occupy the most prominent and influential position and were entrusted to work as teachers as the mouth is the main organ of speech. The arms, being are the seat of strength, the functions of Kshatriyas was to defend the empire. The thighs were the principal repository organs so Vaishyas were destined to provide food to others. The Shudras originated from the feet, and therefore their duty is to serve others just as the feet serve the other parts of the body. The Indo-Aryans considered the aborigines of India as inferior human being and addressed them as *Dasas* or *Dasyus* meaning 'slave'. They were regarded as untouchables and have been treated by the higher social types almost as impure, have been purposely kept ignorant and debased. They have been compelled to labour very hard for the scantiest fare and have been led to regard themselves in the same light in which they were

regarded by other castes, namely, as an unclean, vile, ungodly and contemptible race, not worthy to enter a temple, or to come near a Brahmin, or to perform any religious duty. They were not allowed to use the village well, pond or bathing *ghats*. They were also denied the right to resides in areas, where the houses of higher castes are situated. A separate area in all big cities was allotted where they used to dwell in worst type of slums while in the villages, their lot was even worse, Before the abolition of the zamindari system their first duty was to work for a landlord without any remuneration. Thus their position was virtually that of slaves and, in certain circumstances, even worse than a slave. As this system is based on the birth of an individual, shift from one caste to another is impossible. Many efforts have been made by the social organizations to improve the socio-economic status of the untouchables. The chief efforts in this directions is being made by the *Arya Samaj*. The Untouchable offences Act was passed in 1955. In accordance with the provision of this Act every person is free to perform all kinds of religious and social functions and perform worship of its liking. He or she is free to use all public places like ponds, wells, rivers and roads. Any act committed against this provision has been made punishable. Due to modernization the rigidity of caste system is gradually losing its force in urban areas as compared to villages where caste system is still present in its rigid form which determines the siting and segregation of the

rural dwellings. Although numerical results are not yet very striking the future is more hopeful.

Since the 1931 census, publication of data about the distribution of castes at tehsil level has been stopped. There is non availability of the literature regarding this distribution from any other source. The present information is, therefore, based on the District Gazetteer published in March 1909, and the census of 1931.

3.10. Distribution of Caste

The Hindu structure of society comprises a number of castes and sub-castes in the District.

Brahmins: Among the Brahmins the majority belongs to the Gaur Subdivision. The other subdivisions found in the District being the Saraswat, the Bhat, the Acharaj, the Dakaut, the Sanadh and the Kanya Kubja. According to the settlement report of 1940, the Brahmins then held 4.7 per cent of the land and their property was evenly distributed throughout the District. As cultivators they possessed 7.1 per cent of the total area. After the abolition of the zamindari system in 1952 many of the Brahmins of the District acquired the status of *bhumidhars* and *sirdars* and with the spread of education and the changing times many have taken to other professions.

Rajputs: At the settlement of 1940 as proprietors they held 7.5 per cent of the land, and 10.1% as cultivators, the principal occupation still being agriculture. The distribution of Rajputs in the District is very uneven. The most important subdivisions of Rajputs found in the District are the Dor, Chauhan, Gahlot, Panwar, Tomara, Jadon, Pundir and Bargujar. The Rajputs are more numerous in Sardhana and Meerut tehsil.

Vaishyas: The Vaishyas are generally traders and businessmen. The majority in the District belongs to the Agarwal sub-caste, one of the chief subdivisions of which is the Qanungo, the members of the Rastogi and Baraseni sub-castes also being found here. According to the settlement Report of 1940 the people of this caste held 14.7 per cent of the District. They were strongest in tehsil Meerut of which they held about one fourth- also owing about one fifth of the land in tehsil Sardhana and pargana Hastinapur and 8 per cent in tehsil Baghpat and pargana Garhmukteshwar and Puth. A large number of the Vaishyas of the District belong to the Bishnoi sect.

Taga (or Tyagis): There is a large number of Tagas are found in this District and all of them claim descent from the Gaur Brahmins. At the Settlement of 1940, with 11.8 per cent of the land in their possession, they came third among the landed proprietors of the District. They cultivate their land themselves, they were more numerous in Jalalabad, Hapur, Garhunkteswar and Sarawa.

Jats: The most conspicuous class is that of the Jats, the best farmers of the northwestern U.P. They are divided into a large number of clans, many of which are identical in name with those of the Rajputs. Their two main subdivisions are the Hele and the Dhe. According to the settlement Report of 1940 they held 24.7 per cent of land in the District. They cultivate nearly 30.7 per cent of the total area of the District and in 1940 had more or less monopolised the three northern parganas of tehsils Baghpat which they call their *des* where the proportion of land under their cultivation in 1940 had risen as high as 18 per cent. In most of the parganas, they succeeded in securing the best tracts .

Gujars: During the latter half of the eighteenth century and the beginning of the nineteenth century, there were several powerful Gujar chiefs in the District but by 1901 their possessions had become reduced. The Gujars formerly lived an unsettled life and were much given to cattle-lifting etc. At the settlement of 1940 they held 6.0 per cent of the land in the District. They mostly cultivated their own land and as cultivators in 1940 they held 11.0 per cent of land.

CHAMARS: Chamars are more numerous in Meerut than in any other part of the state except Gorakhpur Division at the settlement of 1940. Their traditional occupation has been leather work and they are engaged in the

leather business . They form the bulk of the agricultural labourers of the District and are found in every pargana.

BHANGIS: The Bhangis, as elsewhere in the state, are usually employed in doing the work of scavenging, etc.

AHIRS: Ahirs are found for the most part in tehsil Baghpat. They invariably cultivate the land themselves and as cultivations held 2.7 per cent of land at the settlement of 1940.

Among the other castes of the District are the Kamboh, Kori, Lodha, Kumhar, Mali, Kachhi, Khatik and Lohar.

The Muslims of the District are the descendants of the early Muslim immigrants. The Saiyids are to be found in the northern parts of the District. They are subdivided into two groups, the Zaidi and Hussaini, both being equally represented. The other subdivisions to which the Saiyids of the District belong are the Rizvi, Jafari and Bukhari. The Sheikhs are quite numerous in the District. Their main subdivisions are the Siddiqui and Qureshi, both of which are strongly represented. The Pathans are found in almost all the tehsils and the majority belongs to the Ghori and Yusufzai clans but members of several other clans are also found here such as the Lodi, Rohilla, Kakar, Tarin, Bangash and Afridi.

The population of Muslim Rajputs is very large here as is the case in the whole of the division. They chiefly hail from the Chauhan, Pundir and

Tomara clans but large numbers, who trace their descent from the Bargujars, Bhattis, Bhale Sultan, Gahlots and others are also to be found in the District. Muslim Jats and Muslim Tagas are also found here.

The Julahas are weavers by profession and are engaged in the weaving of handloom cloth though they have also taken up agriculture as a profession.

The other Muslim castes in the District are generally occupational such as Qassab, Bhangi, Bhisti, Lohar, Teli, Barhai, Darzi, Dhobi, Nai, etc.

CHAPTER II

EVOLUTION OF RURAL SETTLEMENTS

CHAPTER 2

EVOLUTION OF RURAL SETTLEMENTS

The evolution of rural settlements in the region should be systematically analysed with the dawn of civilization. The beginning of rural settlements in this region goes back to the prehistoric period. The waves after waves of different dominant political corporate groups swayed in the region left their cultural imprints that clearly reveal different rulers have dominated the area during historical period.

As rural settlement is primarily an agricultural workshop, any change in the agricultural landscape is bound to radiate modifications in the character and distribution of settlements. The evolution of rural settlements may be traced back to the prehistoric period. This is borne out by the legends, folklore, and historical sources and more convincingly through archeological evidences that this region has experienced the culture of Indus valley civilization. The earliest settlement was traced back from 2000-1800 B.C. at Alamgirpur. The cultural characteristics of this site have very close affinity to many sites of Indus valley civilization, i.e., Mohanjodaro and Harappa. Later on this area was occupied by Aryans and pushed back the aboriginals.The cultural characteristics of Aryans have been discerned through archaeological evidences, legends and the folklores obtained from different sites of the region ranging from 1500 B.C.

to 1200 B.C. The present pattern of settlement distribution is the result of a series of ups and downs of earlier settlements. Hence the evolution of rural settlements in the region can be examined with the help of place name, culture, archaeological evidences and written records since no single evidence is strong enough to analyse the evolution of settlement in the study area.

1.0 PLACE NAME ANALYSIS

It has been proved that place names have survived from very early times and therefore they can serve as another valuable source of the study of the evolution of cultural landscapes. According to Bruhnes, place names are the fossils of Human Geography[1]. The study of place names helps to trace the evolution of rural settlements because their suffixes and prefixes are closely related to the physico-cultural background of an area. The three elements namely ecological diversity, cultural perceptions and dialectical wealth interacting combinedly to produce variety of place names. Knowledge of the regional language of any area is helpful in finding out the real significance of place names. Kemble (1849) discovered the significance of place names ending in ing and ingham in the evolution of Saxon Settlement of Southeast England. These suffixes point to the clans which had settled in the places which now bear their names[2], Alice Mutton

1. Bruhnes, Jean, *Human Geography*, London (1920), p. 239.
2. Singh. R.B., "Historical Geography; Place Names and Settlements - A Review of studies, *National Geographical Journal of India*, Vol. II, Part 1, 1965, March, p. 11.

(1938) has traced various phases of the settlement of the Black Forest and the Rhine areas, based on the evidences furnished by the place-name endings and their distribution[1]. Dickinson (1949) analysed the evolution of German settlements with the help of place name suffixes[2]. Maxwell (1965) has traced the evolution of settlements around Sheffield through various phases of its colonization on the evidence[3]. Nitz (1972) has attempted to trace the evolution of Teutonic settlement in Southern and Western Germany with the help of such evidences. According to him village names with the suffix ingen added to a person's name, belong to the period of Teutonic colonization[4]. Though such analysis is complex it provide some clues to the early human habitats of the area concerned. They also help in indicating the period of their establishment as well as the reason for their nomenclature.

In India, the geographical environment usually influences the place names, which provide clues to the evolution, growth and decay of earlier human settlements. This has clearly been seen from written sources that at different historical periods different place names were in use. Such changes of place name are due to the change of peoples inhabiting them and spoke

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1. Alice, F.A.M., 'Place Names and History of Settlements in South West Germany', *Geography,* Vol. 23, (1933), pp. 113-119.
2. Dickinson,R.E., 'Rural Settlements, in German Lands, *Annals of the Association of American Geographers,* Vol. 39, (1940).
3. Maxwell, J.S., "*The Age of Settlements" from Sheffield and its Region* by Charles Battey (editor). The University Press Oxford, 1956, pp. 121-137.
4. Nitz, H.J., ' Objectives and Methods of Geographical Research in the Evolution of rural settlement Regions', *National Geographer*, Vol. 7, 1972, p. 8.

different languages. Another most important reason for the change of the mode of place names may be seen in the change of the socio-economic conditions. So place name analysis has been used as a device to trace the evolution of rural settlements of the study area. Different place names of the Meerut District along with their associations are shown in Fig. 2.1.

Before discussing the association of the place-names of the Meerut District with physico-cultural factors it would be better to take up the name of the District itself. Such an analysis will reveal the histogenesis of the area.

Different derivations are ascribed to the name Meerut, Merat or Mirath. According to a local tradition the original name was Mayarashtra after Maya, the father of Mandodari (who was Ravana's wife). He is said to have lived here and Mandodari to have worshipped in the local Vilveshvarnath temple, which is believed to be the oldest Siva temple in the District. Others say that Meerut received its name from Mahipal, a king of Delhi.

1.1 Place Names Associated with Geology, Topography and Hydrology

A large number of village names in the Meerut District are associated with various geological, topographical and hydrological features such as mounds, depressions, rivers and the characteristics of the soil. Place name analysis shows that there is one village designated after bhur

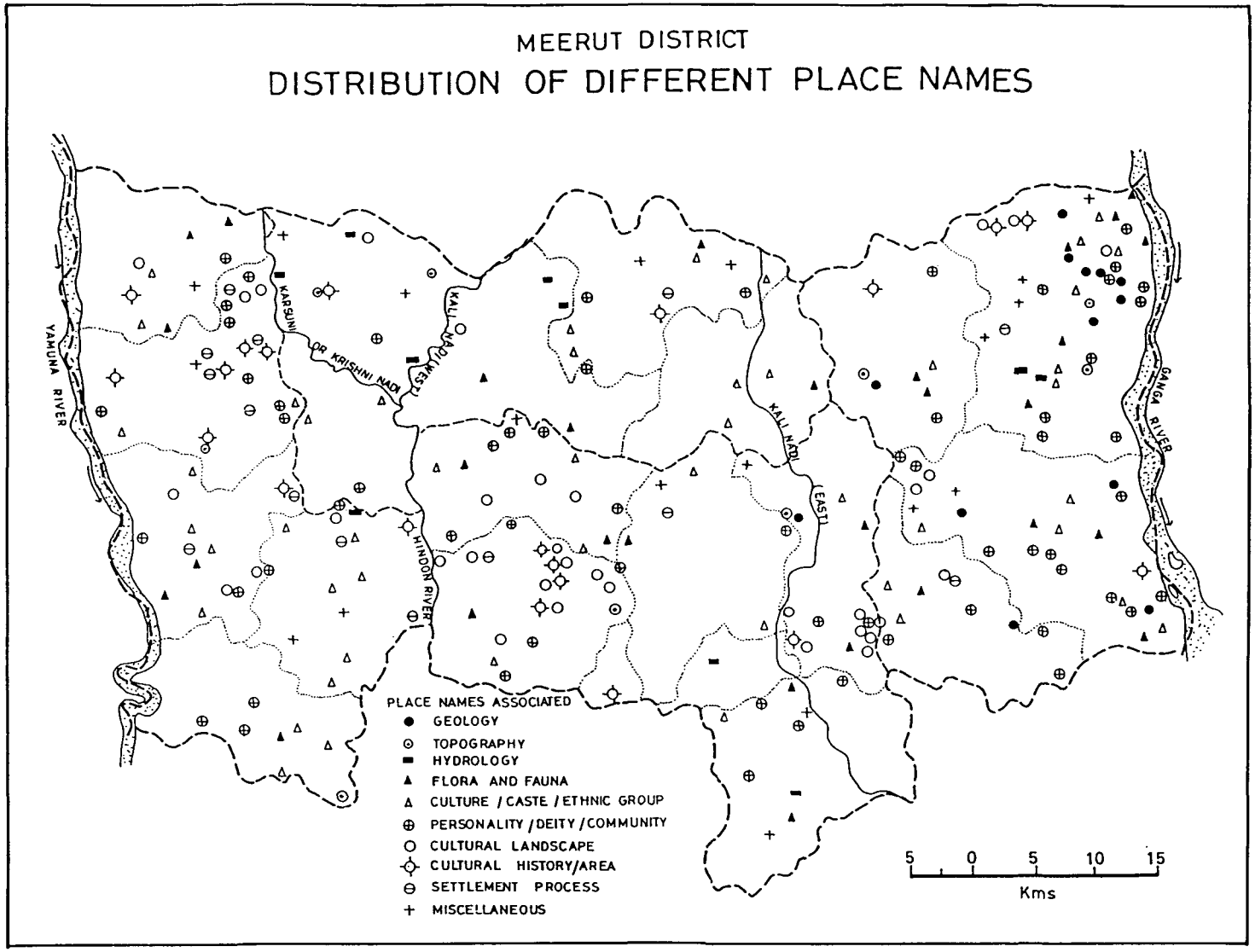
MEERUT DISTRICT
DISTRIBUTION OF DIFFERENT PLACE NAMES
YAMUNA RIVER
KARSUNI OR KRISHNI NADI
KALI NADI (WEST)
KALI NADI (EAST)
HINDON RIVER
GANGA RIVER
PLACE NAMES ASSOCIATED
GEOLOGY
TOPOGRAPHY
HYDROLOGY
FLORA AND FAUNA
CULTURE / CASTE / ETHNIC GROUP
PERSONALITY / DEITY / COMMUNITY
CULTURAL LANDSCAPE
CULTURAL HISTORY/AREA
SETTLEMENT PROCESS
MISCELLANEOUS
5 0 5 10 15
Kms

FIG. 2.1

soil, viz., Bhurpur. Villages Nagli Khadar, Sarai Khadar, Kankar Khera, Bhagwanpur Bangar, Bhagwanpur Khadar, Dudhli Khadar, Dudhli Bangar are associated with various soil types in the study area.

Place names after geographical features including various landforms having suffixes and prefixes like *garh, garhi, dar, mal, kho, teela, khai,* are *densely* distributed in central India. Paharpur, Debigarh, Garhi Kalanjri, Naglamal, Tabelagarhi, Ghat and Doghat can be cited as examples of this. Gangnauli, Nirpura, Shahpur Banganga, Kalandi, Nirawali, Dariapur, Gangheri, Gagaul indicate that the village bearing these names are closely associated with rivers.

1.2 Place names Associated with Flora and Fauna

From the study of place names of the Meerut District, it appears that the area was once largely covered with forests, thickets and groves. The Mahabharata tells us that the country on both sides of Yamuna was an extensive forest known as Khandava, inhabited by Bhils,Nagas, Khandus or Khonds and other aborigines, who were disturbing elements to the Aryan settlers, and, therefore bitter enmity existed between them[1]. In 1827 Heber wrote in his memoir that Meerut stand advantageously on a wide and dry plain, all in pasture, which would afford delightful riding ground.[2] The region provided valuable pasturage to the cattle. Several places in the District

1. Kaur Lachman, Singh, Historical and Statistical Memoir of *Zila* Bulandshahr (Allahabad, 1874), p. 4.
2. Heber, Reginald D.D., "*Narrative of a Journey through the Upper Provinces of India from Calcutta to Bombay* " Vol. II, chapter XIX, p. 275.

were the favourite resorts of the Mughal nobles who often went on hunting expeditions in the Ganga Khadar. In pargana Loni there were a number of gardens and preserves for *shikar* which were maintained by royalty and it is said that the canal, which later came to be known as the Eastern Yamuna canal, was constructed to water one or more of these garden.[1]

Meerut was once called Gajapura because it is believed that when this region was forested, elephants roamed all around. So this region was rich in flora as well as fauna. The villages after the names of trees, flowers, fruits and crops are as Kakripur, Ratauli, Rataul (a variety of mango), Kaili, Bela, nemka, Pepla, Peepli Khera, Khajuri, Murli Gulab.

Baghpat derived from vyaghraprastha or 'place of tigers'. Many villages are found named after the wild animals such as Sherpur, Baghu, Maina Puthi, Lawri Hiranpur, Gajpura, Gajrauli, Gajraula, Chitwana Sherpur, Baghpur, Morna and domesticated animal like Bhainsa. The village Shikarpura clearly indicates that it was also a centre for the hunting of wild animals.

Another example of cultural impact is the villages ending with the suffix wan (the woods) for e.g., Tugawan and Bhagwanpur Chittawan. Kirthal was originally a forest where elephants were to be found on account of which it came to be known as Karithal (the place of elephants.

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1. District Gazetteer, Meerut, p.40.

1.3 Place Names Associated with Culture, Castes and Ethnic Groups

There are many villages in the Meerut District, which have been named after castes and communities inhabiting them. Such villages are mainly hamlets that are attached to the main villages Chamrawal, Chamraud, Jatauli, etc. are named after communities of the scheduled castes. Likewise various hamlets are also designated after other low castes communities such as Luhara, Luhari, Ghosipur, Ahera, Kheri Manihar, Kaharka, Julehra etc. Meerut was dominated by Jats, Brahmins, Rajputs, Tagas and Gujars since a long time and the place-names of the villages are the indicative of this for e.g., Rathaura, Rali Chauhan, Poothi Brahman, Singhaoli Taga, Jataula, Kheri Jatran, Jatpura, Norozpur Goorjar etc. Many villages in the District have been named after different castes of Muslims, like Sheikhpur, Sheikhpuri, Nagla Shekhu, Fakharpur Sheikhpura (after Sheikhs), Aghwanpur, Pathanpura, Khanpur (after Pathans), Bilochpura (after Bilochs).

1.4 Place Names Associated with Deity, Personality and Community

Religion stands behind many place names. Gods and deities have also found their names associated to many villages. Meerut, the home of Kauravas and Pandavas have closely associated to Lord Krishna, its physico-cultural and socio-economic attributes attained religious sanctity. He became the base not only of a cult of worship but also a distinct culture in which he himself, his beloved Radha, brother Balaram, parents and friends became central figures. Meerut District, having close links with Mathura, has therefore many place names associated with braj culture. It is

well known that among all the epithets of Srikrishna, those associated with cow stand very prominent. Cow shield and its worship has become an integral part of the braj culture. The place names Gopalpur Khadana, Kishanpur, Goripur, Ibrahima Gauri, Kishanpur Birana, Gokulpur, Manoharpur, Govindpur Sakarpur, Murlipur Phool, Pachgaon Patti Gopal, Kishori, Kishorepur and Badha Girdharpur clearly indicate that these places have strong cultural associations with the *braj* culture.

Besides the Krishna cult, there are other cults in the region, which have influenced the rural life of the people of the District. Siva *lingums* (Phalluses) have been discovered from a large number of mounds of the area and some of them have been installed in the temples and some are still lying over the mounds. These lingums are being worshipped as Kherapattis (Lords of the Mounds), and are considered protectors of the village. Shivpuri, Shivpura or Pura, Shipura, Haripur, Mahadeo are some villages named after Shiva.

Lord Rama is also popular in the region. There are many villages in the District which have been named after him and his associates, i.e., Sadipur urf Ramnagar, Paharpur Ram, Rampur Sadhu Nagli, Ramala, Rampur Khurd, Rampur Ghoria, Angadpur etc. The place, Baleni is associated with the Sage Valmiki where Sita lived in exile and gave birth to Lava and Kush. In the vicinity a temple is dedicated to Valmiki now it has have been found scattered remains of burnt bricks bearing religious motifs.

Other important place names after Gods and Godlings are Fatch Naraini, Haripur Bhagwanpur etc.

Some villages borrow their names from important persons, kings, saints etc. Parikshitgarh derives its name from king Parikshit of Hastinapur. King Hastin founded Hastinapur. Akbarpur Dhaska Jalalpur, Akbarpur Khadar, Himaupur, Jahangirpur, Shahjahanpur are villages named after Moghul emperors. The name, Ajrara owes its origin to a yogi named Ajaipal who built a temple here and called it Ajaipara, the present name Ajrara being its corrupt form. Karnawal derives its name from Raja Karna of Mahabharata fame that is said to have made a halt here while going to Hastinapur. Mawana derives its name from Mana, a Huntman and a reputed servant of Kauravas of Mahabharata fame. One tradition connects Kharkhauda with Khara and Dushana, the brothers of Ravana, the Rakshasa king of Lanka. Phalauda found by a Tomara Rajput named Phalgu.

1.5 Place Names Associated with Cultural Landscape / Functions

A large number of villages using suffixes and prefixes like *khurd, kalan, buzurg and pur, pura, garh, garhi, nagar, gaon, majra, majri*, etc. indicate the sizes and ages of villages. Village names ending in *kalan* or *khas* and *khurd* or *Pura* designate generally the earlier and late settlements

respectively and 'big' and 'small' as these Persian words imply.[1] Rathaura Kalan, Saroorpur Kalan, Mavi Kalan, Rathaura Khurd, Panchli Khurd, Jani Khurd, Nirpura, Dhanpura, Puth Khas, Siwal Khas, Publikhas, Pachgoan Patti Gopal, Alampur buzurg, Jani buzurg, Khwajampur Mazra, Nagli Mazra Mataur, Mal Mazra, Ram Nagar etc. may be cited as examples of such names. The places with *chak* (large area) indicate the settlements of medieval period, founded by Muslim rulers e.g., Fatehpur Chak, Chak Paswara and Chak Morna. Tilwara Patti, Patti Kerki, Pachgaon Patti Sanwal, Pachgaon Patti Gopal, Pachgaon Patti Amarsingh are the good examples of place names bearing Patti (smaller settlement). The suffix, *buzurg* used in a village, denotes a larger village size. Similarly, village names having terms like garh, and garhi, suggest former seats of the local chiefs where the people used to assemble for safety and security.

1.6 Place Names Associated with Culture History and Culture Area

It has been obvious from the earlier studies that the suffixes and prefixes like *pur, nagar, gaon, garh* and *ghat* must have been derived from the Sanskrit language mostly of Hindu origin, while *ganj, bazar buzurg, khurd, bad* etc. are taken from Urdu and Persian. Place name having affixes *dhana, kheri, kheda, dhab, falia, tapra* seem to be of Dravidian origin mostly associated with the areas occupied by tribals. This fact

1. Singh, K. N., "The Territorial basis of Medieval Town and village settlement in Eastern Uttar Pradesh, India, *Annals of the Association of American Geographers*, Vol. 58,1968, p. 211.

indicates that non-Aryan settlers long before their Aryanization once inhabited the area. The places with *wali* and *wala* show the impact of Punjabi culture. Halalpur, Mahabatpur, Dhanaura Silver Nagar, Amroli urf Baragaon, Debigarh urf Phalera, Doghat, Mavi Khurd, Jani Khurd, Jani Buzurg, Daulatpur, Fakhrabad urf Kayasth Gaori, Kasampur Kheri, Datawali Gesupur, Barwala are some examples of such village.

1.7 Place Names Associated with Settlement Process

Place names do reveal process of settlements by Dravidian, Aryans, Mohammedans and other cultural groups in various parts of India. *Pur, gaon, kheri, nagar, garh* as suffixes in Aryan settlements while *khedi or kheri, kheda or khera, pada* or *para, rundi, lya* and gondi affixes in Dradividian settlements and *ganj, bad, sultan, sijal, begam, fateh* and Mohammad etc. are Muslim states of the past are indicative of such processes. Most of the settlements along the national or state highways were temporary camps of the Mughal armies e.g., Aminnagar Sarai, Sarai Qazi, Sarai Khadar, so most of them lie deserted. According to a local tradition the place Amin- nagar Sarai was founded about five hundred years ago probably as a sarai by Amin Shah and was named after him. Baoli derives its name from one Babubali who is said to have founded it six hundred years ago.

Newer settlement processes are well reflected through pladce names like Bana (forest hamlet). Kirthal was originally a forest where elephants

were to be found on account of which it came to be known as Karithal the place of elephants, which became Kirthal in course of time.

There are many settlements, which could not be placed under any of the groups identified earlier. These of multifarious origin are grouped under 'Miscellaneous' category e.g., Motihari, Sona, Chhattri, Hajipur etc.

The foregoing discussion regarding place names of settlements clearly reveals that there is a strong physico-cultural and socio-economic bearing upon the place name of the settlement in the study area. It is observed that about 33.5 per cent indicate their relation with the physical environment while the rest 66.5 per cent named after cultural processes. It has been observed that there is as such no definite pattern of the distribution of place name but it may be said that the place name associated with flora and fauna scattered all over the District. This is true that this region was once covered with forests before clearings and preparation of ground. But the place name associated with water and soil are usually occurring near water resources. The place names after cultural elements scattered all over the region, as there is no definite pattern. It is clear that the place names analysis is the important device to comprehend the ecological and historical setting of the region.

2.0 EVOLUTION OF TERRITORIAL UNITS THROUGH LAND OCCUPANCY

The occupation of land has been a universal process for the formation of territories among corporate political groups throughout the

human history. The dominant corporate group always occupied the key points of a territory and allowed other, non-corporate groups of men and women, to settle on a land given to them in order to carry out their socio-economic activities within its organizational framework. Thus territory formation was the first step in the process of settling at lower level. Due to this, there has been a strong link between settlement patterns and economic activity.[1] Territory formation in the initial stage was not usurpation of the region but the occupation of a virtually virgin or thinly populated land by a group of study people on a small scale. Such an area had enough scope for expansion of the settlement and development of socio-economic and political institutions with a view to ensuring peaceful existence and defence the course of land occupancy and actual settling processes, emotional and historical ties developed among the inhabitants, which, tended to bind them to live together in a territory. Such a territorial occupation required autonomy for the occupants to function as a viable unit. Many cultural institutions such as shrines, markets, fairs, and places associated with gods and godlings came up in the course of the settling process and these made the inhabitants feel that some places were vital for, the well being of the group and must be defended. The occupied land, the shrine, the family burial ground and stones of local festivals also

1. Blouet, B.W., 'Factor influencing the Evolution of Settlement Patterns' in *Man Settlement and Urbanism,* ed. P.J.UcKo, London: Duckworth, (1972), p. 3.

generated a sense of belonging to the territory among the settlers which was shared by the non corporate group with those of the corporate political group. As such, the territory becomes a complex symbol of possessiveness, means of sustenance and well being and security and culture evolved over a period of time.

At the time of the original occupancy there was no fixed territorial system. However, later these territories developed as clan based republics headed by their chiefs.[1] During the medieval period there was three-level political structure in almost all parts of India. At the top was Delhi or central government, in the middle was the regional or provincial administration and at the base was the hegemony of the locally dominant corporate group. An occupied territory generally termed *raj* or *ilaqa*, was the primary clan area and came to be known as the pargana. The pargana was segmented into sub-clan or secondary clan areas known as tappas, which were subdivided into smaller territorial units were known as goan (grams). As a result of this three tier division, there evolved a hierarchy of settlements, the original chief settlements at the pargana and tappas levels developed as quasi-urban settlements because of their respective territorial and sub-territorial commands of leadership and resources, whereas the gaon evolved as the basic rural unit of settlement with local resource utilization and political

1. Fox, R.G., 'Rajput Clans and Rurban Centres in Northern India, in *Urban India: Society, Space and Image*, R.G. Fox (ed). Duke University Monograph, No.10 , (1970) , p.27.

power. Under the prevailing linear political system, these three units i.e., gaon, tappa, and pargana were territorially structured on the functional principles of kinship and descent from the ancestor or founder of the dominant clan.[1] These settlements were, thus, arranged on the basis of hierarchy, both areally and functionally from the very beginning and continued to remain so until forces of modernization broke them up.

During the British period, a five-tier territorial system was introduced, i.e., pargana, tappa or turf, taluka, patti and gaon in descending order. The Britishers brought about enormous changes in the civil and administrative set up. The parganas were maintained as subdivisions of a tehsil and were used as revenue units and they continue to function as such. Earlier, tappa was used as a fiscal division, but later, the Britishers recognized the tappa as a sub-clan territory. Not only were taluqdari and zamindari and other territorial rights of land corresponding to them given weight, but they also formed the basis of surveys and records of holding rights.

Four years after India achieved independence the Zamindari Abolition Act was passed by the U.P. Legislature in May 1951, and by January 1956, all the Zamindari estates were abolished. The Meerut District was divided into seventeen administrative cum planning divisions, called development blocks, and these have been sub-divided into Adalat

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1. Singh, K.N., 'The territorial Basis of Medieval Town and Village Settlement in Eastern Uttar Pradesh, in Reading *in Rural Settlement Geography*, pp. 66-7. (ed.) Singh R.L., K. N.Singh, Rana P. B. Singh, National Geographical Society of India Varanasi, (1975).

Panchayats which have 8 to 12 villages per Adalat Panchayat, on an average.These units are often independent of the clan boundaries and other social ties.

The foregoing discussion reveals that different people and societies had introduced their own methods of spatial organizations and agricultural systems, which during the course of time, intermixed and metamorphosed and thus the present territorial system was evolved which has a distinct structural pattern.

The objective of the present study is to discuss the various zamindar clans of the Meerut District from the sixteenth to the nineteenth century, who functioned as corporate territorial groups and served as dominant local power in different parts of the region. Information regarding the territorial evolution of the District in the ancient period is not available. So the study is primarily based on medieval sources, and particularly on the information contained in Ain-i-Akbari and Final settlement Report of 1874. Information regarding earlier times is based on local tradition. Information gathered from these sources has been supplemented with the data collected during field survey.

In Akbar's days the present pargana roughly correspond to the 16 mahals, which formed a part of two sarkars (Delhi and Saharanpur) in the Suba of Delhi. Of these mahals Sardhana was included in the sarkar of Saharanpur and together with the bulk of the present District of

Muzaffarnagar, formed a dastur, those of Jalalabad, Barnawa, Hapur, Sarawa, Garhemukteshwar, Meerut and Hastinapur (comprising the Meerut dastur) those of Loni, Dasna, Baghpat, Jalalpur, Baraut, Kotana, Chhaprauli and Tanda Phugana[1] (Fig. 2.2).

A study of the zamindar clans between the sixteenth and the eighteenth century reveals incursions on the territories of these mahals, their pattern of settlements, areas of jurisdiction and successive changes therein in the region during the period.

There were many zamindar clans, which held lands in the region. Some of the important of these clans were Jats, Brahmans, Chauhans, Tomars, Tagas, Ranghar, Chandrals, Ahirs, Sheikhzadas, Afghans, Pathan and Sayyids. The territorial jurisdiction of these zamindar clans have been clearly marked out in Fig. 2.3 A & B. These figures have been carved out on the basis of the data contained in the Ain-i-Akbari and the actual position recorded in Settlement Report of 1874. It may be noted that these information has been supplemented with data collected during the field survey of the region. By and large, the present local traditions confirm earlier ones contained in Ain-i-Akbari and various settlement reports and gazetteers. The zamindar clans have been a dominant factor in encouraging the evolution and growth of rural settlements in the region. So

1. From the boundary as shown in Irfan Habib's Atlas of the Mughal Empire, (1987) p. 125.

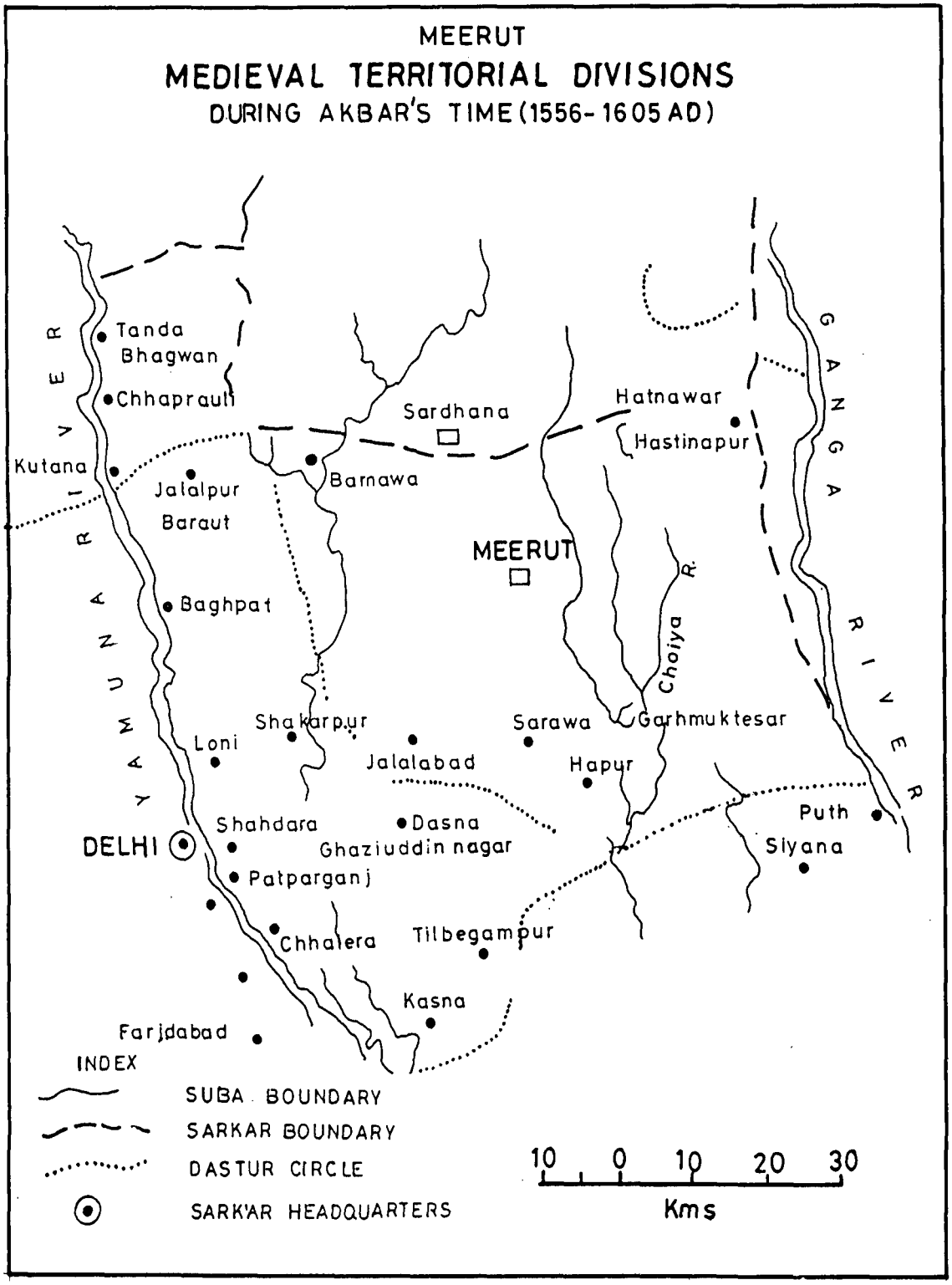
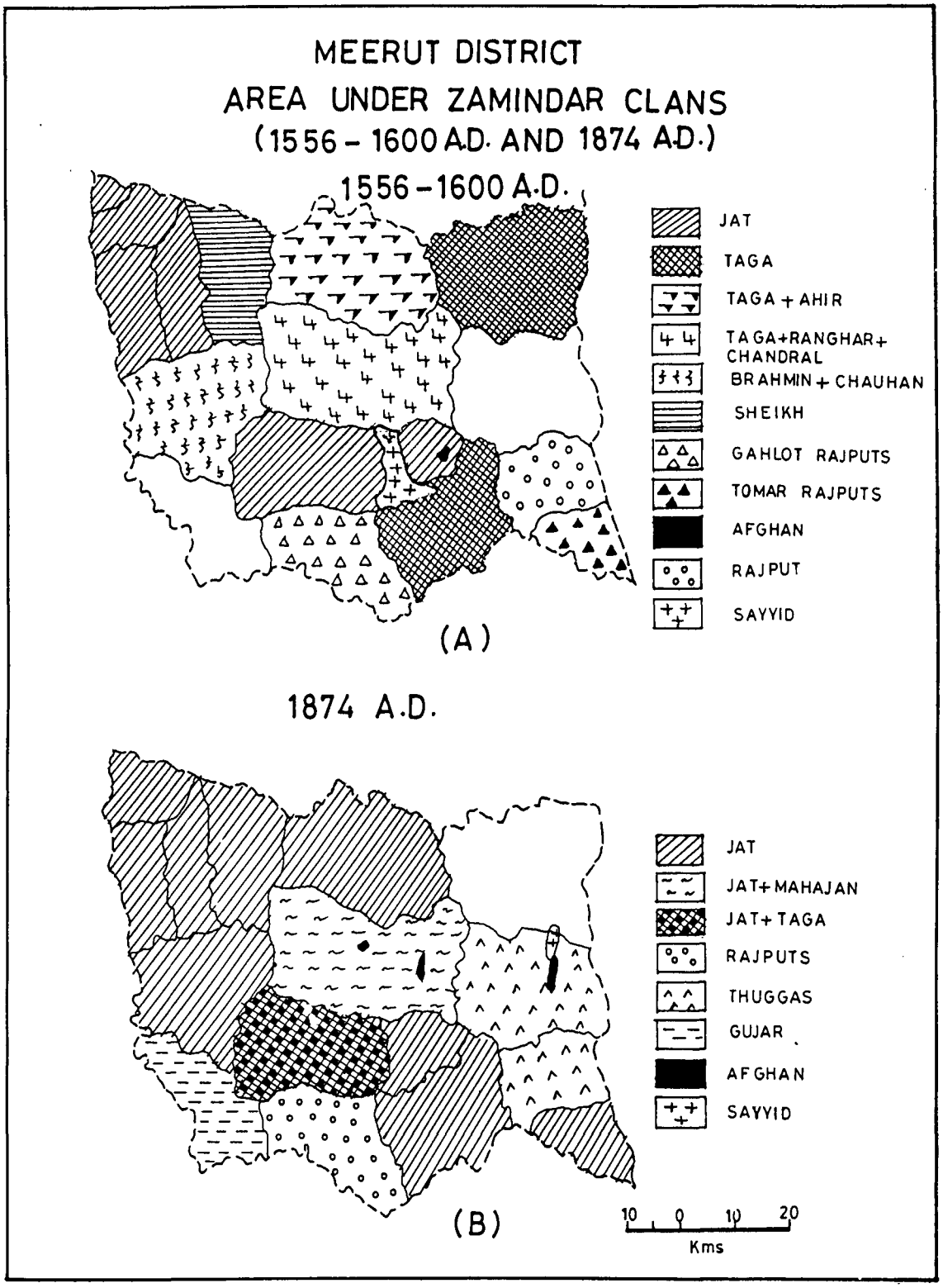

MEERUT
MEDIEVAL TERRITORIAL DIVISIONS
DURING AKBAR'S TIME (1556-1605 AD)
YAMUNA RIVER
GANGA RIVER
Choiya R.
Tanda Bhagwan
Chhaprauli
Kutana
Jalalpur Baraut
Baghpat
Barnawa
Sardhana
Hatnawar
Hastinapur
MEERUT
Shakarpur
Loni
Jalalabad
Sarawa
Garhmuktesar
Hapur
Puth
Siyana
DELHI
Shahdara
Dasna
Ghaziuddin nagar
Patparganj
Chhalera
Tilbegampur
Kasna
Farjdabad
INDEX
SUBA BOUNDARY
SARKAR BOUNDARY
DASTUR CIRCLE
SARKAR HEADQUARTERS
10 0 10 20 30
Kms

FIG. 2.2


MEERUT DISTRICT
AREA UNDER ZAMINDAR CLANS
(1556 - 1600 A.D. AND 1874 A.D.)
1556 - 1600 A.D.
JAT
TAGA
TAGA + AHIR
TAGA+RANGHAR+ CHANDRAL
BRAHMIN + CHAUHAN
SHEIKH
GAHLOT RAJPUTS
TOMAR RAJPUTS
AFGHAN
RAJPUT
SAYYID
(A)
1874 A.D.
JAT
JAT+ MAHAJAN
JAT+ TAGA
RAJPUTS
THUGGAS
GUJAR
AFGHAN
SAYYID
(B)
10 0 10 20
Kms

FIG·2.3

the study of the territorial jurisdiction of different zamindar clans is essential in order to trace the evolution of the villages in the study area. The account of some of the important clans along with their areas of settlement is given below:

Brahmins

The Brahmins are scattered throughout the District. Among the Brahmins the majority belongs to the Gaur subdivision, the other subdivisions found in the District being the Saraswat, the Bhat, the Acharaj, the Dakaut, the Sanadh and the Kanyakubja. During 1556-1605 A.D they were chiefly found in Baghpat and Meerut tehsils but in 1874 A.D the Jats acquired their villages and they left with only 10 villages but they strengthened their position in Sarawa and Kotana. They plough their land, as, unlike their counterparts, ploughing the land has never been tabco for them in this District. Enjoying the privilege of being the priestly caste, the Brahmins acquired a number of villages as muafi (freehold) lands. Later, they extended their zamindari possessions even more and, as bankers and moneylenders, and thereby acquired a large number of other villages.

Rajputs

The different clans of Rajputs found in the District are Chauhan, Tomara, Gahlots, Dor etc. During sixteenth century the Chauhans dominated in the pargana Baghpat and Ranghar in Meerut, Gahlots in Dasna, Tomara in Puth. The Rajputs also dominated in Pargana

Garhmukteshwar. By 1874, they are more numerous in Sardhana and Meerut. Now they lost their holdings to Jats and left with only 11 villages in hand. These Rajputs are both Hindu ands Muslims. Rawa Rajputs occupied second position after Jats in Kotana.

The Hindu Rajput clans in the District are zamindars holding 194 villages and Muslim Rajputs hold 48 villages. The largest landholders are the Gahlots, Tomars and Sombansis. The Gahlots were a powerful tribe in the twelfth century. One of Prithiviraj's best generals was Govind Rao, a chief of this tribe, who is said to have resided at Dehra in this District. They now hold 4 villages in Baghpat tehsil, 7 in Hapur and 27 in Ghaziabad. Muslim Gahlots hold nine villages. The Tomars are very numerous in this District. They look on themselves as the descendants of the Pandavas, and many claim kinship with the Tomar dynasty of Delhi that was overthrown by the Chauhans. Now they hold 2 villages in Mawana, 32 in pargana Puth in Hapur, 12 in Meerut and 34 in the Ghaziabad tehsil. Muslim Tomars possess eight villages in Hapur and three in Baghpat. The Hindu Dor Rajputs have four villages, all of them are situated in the Hapur tehsil, and while their Musalman brethren in the same tract have 16. The Dors are said to have held the land between Koil and Meerut, and under their leader Haradatta attained to considerable power. It was Haradatta who built the fort of Meerut and founded Hapur. At the time of Prithiviraj the power of the Dors began to wane. The Mina Meos on the one side pressed them, while

the Gahlots expelled them from Dasna on the other. The Badgujars an old tribe still in possession of a large number of villages in Bulandshahr and they occupied the southern part of the District. The chief of them is the Sabit Khan a family of Pilkua or Pilkhuwa but their influence ended with Daulat Rao Singh, whose estates went on sold by auction in 1815. The Nirban or Nirbghan Rajputs are said to have formerly been a numerous and powerful tribe in this District, but for ages all Nirbhans have been Musalmans they now hold only two villages in pargana Ioni in tehsil Ghaziabad.

The chauhans have zamindaris in eleven villages. They are found principally in Sardhana, where in the Hapur, Mawana and Meerut tehsils. The Muslim Chauhans possess four villages. Panwars hold five villages in Sardhana and one in Baghpat

Jats

Among the most prominent proprietor castes, the most conspicuous class is that of the Jats, the best farmers in the Northwestern provinces. They occupying nearly the whole of the rich Hindan Yamuna Doab, only giving way to inferior agricultural castes in the poorer land on the slope of the valley between the rivers. They may also be said to prevail in the central pargana of Sarhama. Meerut, Jalalabad, and Hapur. Although here they share the proprietorship with Tagas and Rajputs, and they are not wanting in most of the eastern parganas, but as in the west, they do not

extend to the poorer land above the river. As proprietors they hold zamindaris in 488 villages and altogether have influenced the character of Meerut more than any other caste. In the Doab they are divided into two great classes- the Hele and the Dhe. The Hele subdivision is by far the most numerous in this District, almost found in every pargana. The Dhes occupy several villages in the neighborhood of Babugarh and Hapur as Bachota, in the Sardhana tehsil they hold Chabariya, and in Meerut, Zainpur and other villages in its neighborhood. They first settled in the northwest coruer and drove out the Tagas from Chhaprauli, Kotana and Baraut, and gradually extended their possessions throughout the whole District. Of the villages given above, 151 are situated in the Baghpat, 49 in Mawana, 37 in Sardhana, 105 in Hapur, 86 in Meerut and 60 in the Ghaziabad tehsil.

During sixteenth century the Jats strongholds were the Jalalpur Baraut, Chhaprauli, Tanda Phugana, Kotana and Jalalabad pargana. As the time passes they acquired other lands under their hold. They extended southwards and hold the pargana Baghpat having 32 villages in hand.As well in Ghaziabad tehsil the Jalalabad pargana. They also acquired Hapur with 43 villagesleaving behind Tagas with 23 villages, Garhmukteshwar (14 villages) Loni (8 villages).

Tagas

The Taga tribe is one of the most numerous in this District. During 16th century they have strongholds in different parganas i.e., in Hapur,

Hastinapur, Meerut (with Ranghar and Chandral) and in Sardhana (with Ahirs). But in 1874 A.D they lost their position to Jats and have only 23 villages. In Loni they have 25 villages and in Jalalabad they have 40 villages. Now they hold 20 villages in Baghpat.

Gujars

During 16th century the Gujar estates are not mentioned but in 1874 A.D they were numerous in the District. The Gujars are of very unsettled people and adopted the habits of plundering and cattle lifting. Their favourite home in this District is in the jungle tracts in the Khadars of the Yamuna, Hindan and Ganges, where the rough, uncultivated wastes afford them good pasturage for their cattle. During the latter half of the past century and the first quarter of the present century there were several powerful Gujar chiefs in this District, but their possessions have been much reduced during the old settlements. At the end of the last century Jit Singh Gujar of Parikshitgarh, was one of the most powerful Hindu chieftains in the District. In the time of Raja Gulab Singh, Bahsuma became the headquarters of the Gujar confederacy, and continued so until the union of Landhaura and Bahsuma estates. The Gujars have zamindari possessions in Baghpat, Mawana, Sardhana, Hapur, Meerut and Ghaziabad tehsils and particularly they dominated in the Loni pargana of the Ghaziabad tehsil. Here they have 31 whole estates and have share in 14 others.

Ahirs

The Ahirs have occupied the major part of Baghpat tehsil. The Ain-i-Akbari reveals that to Ahir zamindars are found in Nagina and Sardhana, and absent in Sardhana during 1874 A.D. Among the Ahirs in the District the Deswals of Baghpat are the most numerous, holding 18 villages in Baghpat pargana.

Shaikhzada

Sheikhs were dominated in the pargana Barnawa during 1600 A.D but in 1874 mostly Jats captured these lands and in Loni they have 7 estates and a few are also in Garhmukteshwar.

Sayyids and Pathans

Some villages near the vicinity of the Ganga river are held by Sayyids and Pathans. The Sayyids acquired their zamindari at the time of Musalman conquest and the Pathans during Jahangir reign. So in Ain-i-Akbari there is no record of their zamindari possession. In 1874 Sayyid possess one village share with Jat in pargana Puth and Garhmukteshwar, and in Meerut they have a few patches. The Pathans have 6 estates in Puth.

On the basis of above discussion the position of different zamindar clans from the sixteenth century to 1874, it may be concluded that the Rajputs, who were once dominating in the District, were reduced to the second position and that Jats extended their zamindari considerably to gain

the first position in the District, and that the Gujars, Mahajan and Thuggas, who were not on the scene in the sixteenth century appeared as the dominant clans. Brahmins and Tagas also lost their holdings in 1874.

3.0 RURAL SETTLEMENTS IN SEQUENT OCCUPANCY

The study area records successive stages of evolution in the process of occupancy at various places. In the absence of detailed archaeological and anthropological investigations, it is difficult to carve out the cultural history of the District. However, based on available literature and excavations made in the nineteenth and twentieth century, an attempt has been made to trace the historical growth of settlements and rural landscape. The evolution or the histogensis of settlements in this District can be evaluated through four successive periods (Fig 2.4).

1. Pre-Historic Period
2. Ancient Period
3. Medieval Period
4. Modern Period

3.1 Pre-Historic Period (upto 1800B.C.)

Long before the arrival of Aryans the region had settlements of the aboriginals. Excavations at various sites of the region have shown that settlement of this region had begun around (2000 – 1800 B.C.). The earliest remains i.e., terracotta cakes, steatite and faience beads, kiln-burnt bricks, a furnace, animal figurines, inscribed pots, a broken blade of bronze or

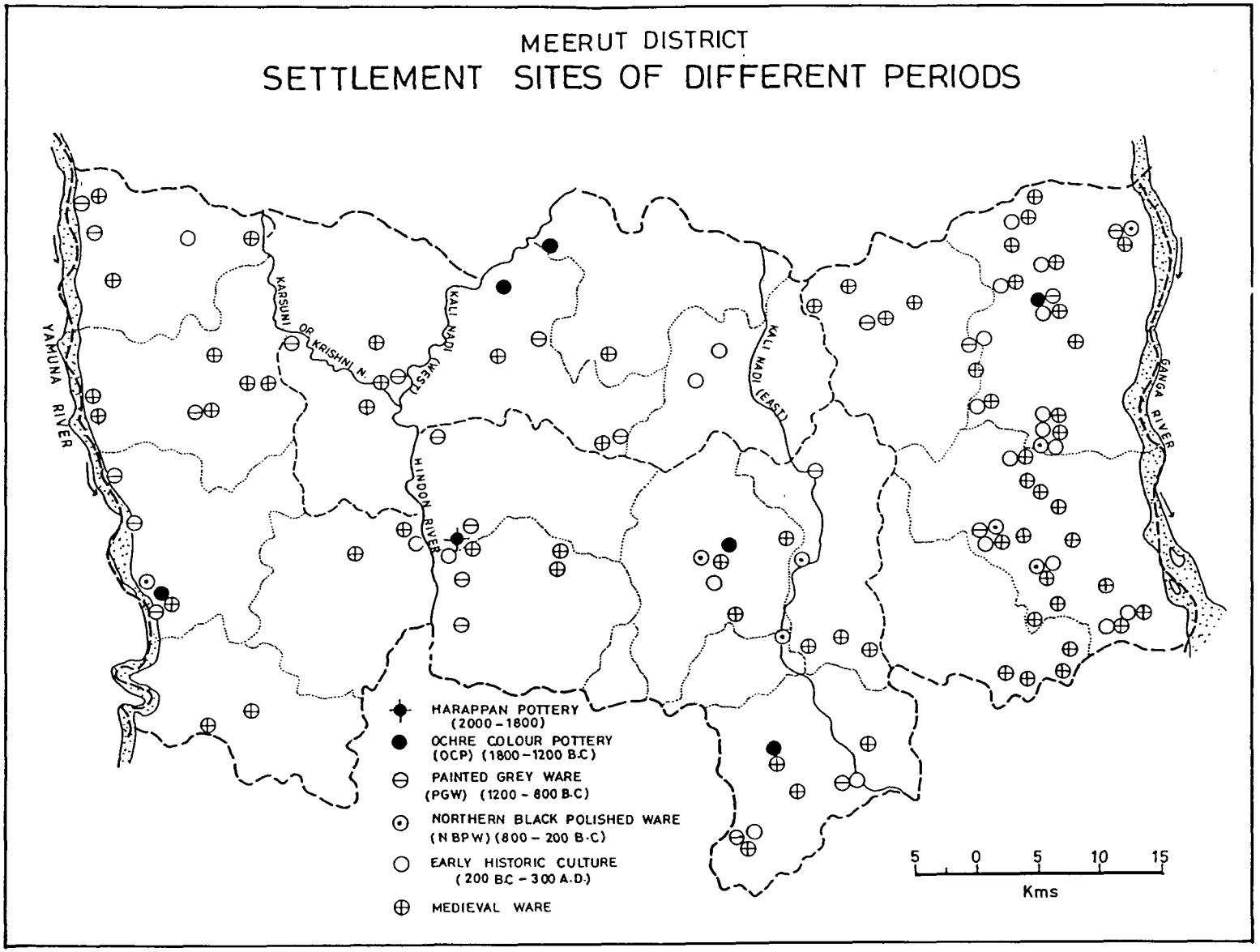

MEERUT DISTRICT
SETTLEMENT SITES OF DIFFERENT PERIODS
YAMUNA RIVER
KARSUNI OR KRISHNI N.
KALI NADI (WEST)
HINDON RIVER
KALI NADI (EAST)
GANGA RIVER
HARAPPAN POTTERY (2000-1800)
OCHRE COLOUR POTTERY (OCP) (1800-1200 B.C)
PAINTED GREY WARE (PGW) (1200-800 B.C)
NORTHERN BLACK POLISHED WARE (NBPW) (800-200 B.C)
EARLY HISTORIC CULTURE (200 B.C-300 A.D.)
MEDIEVAL WARE
5 0 5 10 15
Kms

FIG. 2.4

copper have been found at Alamgirpur (about sixteen miles west of Meerut city). These antiquities are believed to have belonged to the Harappa phase of the Indus valley culture and point to the site having been a station of that culture in the region[1] (Plate No.2.1 and 2.2).

3.2 Ancient Period (1800 B.C. – 300 A.D.)

Historical evidences reveal that Aryan settlements originated in the Indus valley and spread over Ganga valley in about 1600 B.C. Archaeological excavations at Hastinapur (about five miles west of Ganga, in tehsil Mawana of Meerut District) revealed various antiquities, which are taken as evidence of a succession of cultural periods, which this site enjoyed during the past four thousand years or so. The pottery, which is the earliest unearthed at Hastinapur,[2] is crude "Ochre-colored pottery" (OCP, 1800 – 1200 B.C.). The other OCP sites in this District are Kharkhauda, Malehra, Nahli and Saket colony. The region is also rich in the deposits of painted grey ware (PGW, 1200B.C - 800 B.C.) and its associated wares i.e., red slipped ware (RSW), black slipped ware (BSW) Plate No.2.3. Various PGW sites are Alamgirpur, Hastinapur, Dabka, Parichhatgarh, Kaseri, Atrara, Sarawa, Kalina. Mohammadpur Dhumi, Bamnauli, Kuri, Khindwari, Nethla, Sultanpur Hitana, Tanda, Dhanawali, Dabathua, Nagla Hareru Madhya Ganga Canal, Barnawa, Bisrakh, Baleni, Baghpat, Pura and

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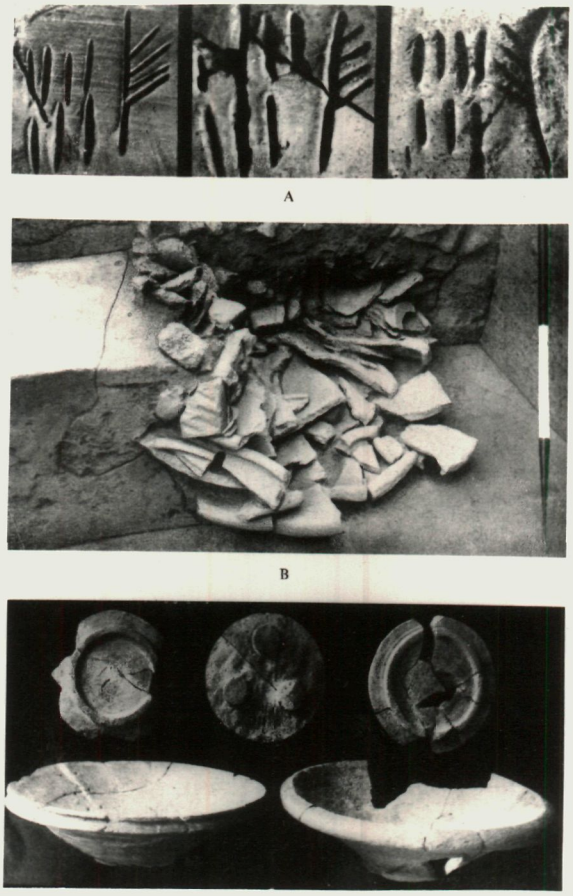
1. *Indian Archaeology* 1958-59 – A Review, New Delhi, 1959, pp. 52-55.
2. Lal, B.B., "Excavations at Hastinapur and other exploration in the Upper Ganga and Sutlej Basin, 1950-1952", *Ancient India*, (Bulletin of Archeological Survey of India, No. 10 and 110, 1954), pp. 3,11

2.1 Alamgirpur: Harappan painted pottery



2.2 Alamgirpur: Harappan pottery

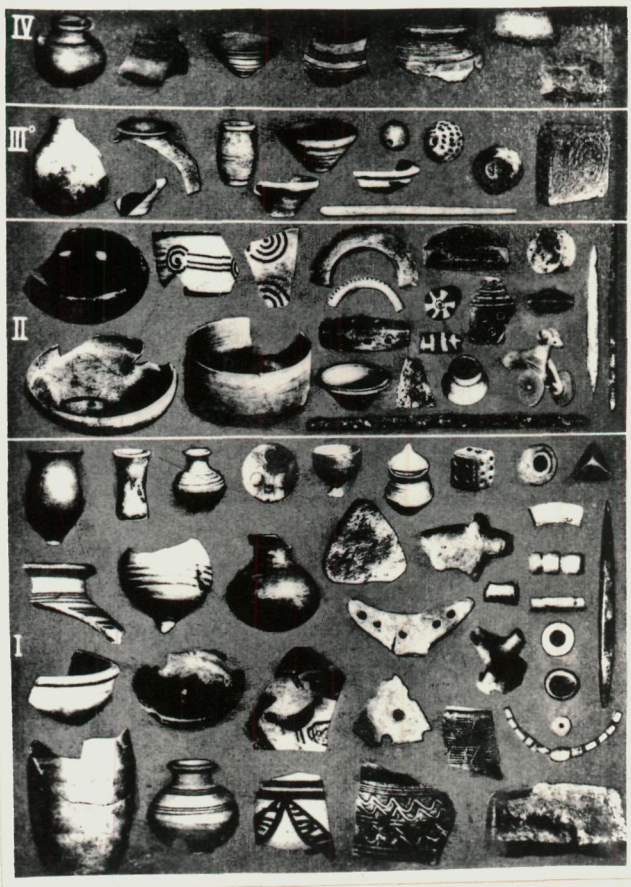
2.3 Hastinapur: Painted Grey ware pottery

Muzaffarnager Saini. The classical Northern Block Polished ware (NBPW, 800 B.C – 200 B.C.) (Plate No.2.4) culture in the Ganga valley is distinguished by the extensive use of iron, introduction of coinage, a well-stratified and economically strong society, expansion of Buddhism and assimilation of a number of smaller states into one of the biggest empires of the ancient world. Its associated sites are Hastinapur, Jalalpur, Rali, Godha and Dabka. The Early Historic culture (SKBRW, 200 B.C-300 A.D) consists totally of red ware. The pots are wheel made and generally have a medium-grained fabric Stamped and incised designs are found on pottery, mainly on the outer surface. Use of burnt brick was prevailing. Fine specimens of moulded terracotta figurines and Sunga terracottas were found in Hastinapur (Plate No.2.5 and 2.6) while in Alamgirpur various of pottery of different periods and unlined soak wells are found of this period (Plate No.2.7). Coins occurred throughout the period included the coins of rulers of Mathura (2nd century B.C) and Yaudheyas (about the beginning of Christian era and coins of Kushan King Vasudeva (about the middle of the 3rd century A.D). So the "SKBRW' denotes the "Sunga and Kushan black and red ware. The early historic culture mainly prevailed in Alamgirpur, Hastinapur, Madhya Ganga canal, Ulaghpur, Mataur, Daurala , Jalalpur, Rali, Sarawa, Atrara, Tajpur, Shondat, Parikshitgarh, Maur Khurd, Mohammadpur Sikera, Kuri Kamalpur, Garhi, Ferozpur, Godha, Humayunpur and Khaikhera. The medieval period is also represented by Decorated pottery as well as Glazed ware (Plate No. 2.8 and 2.9).

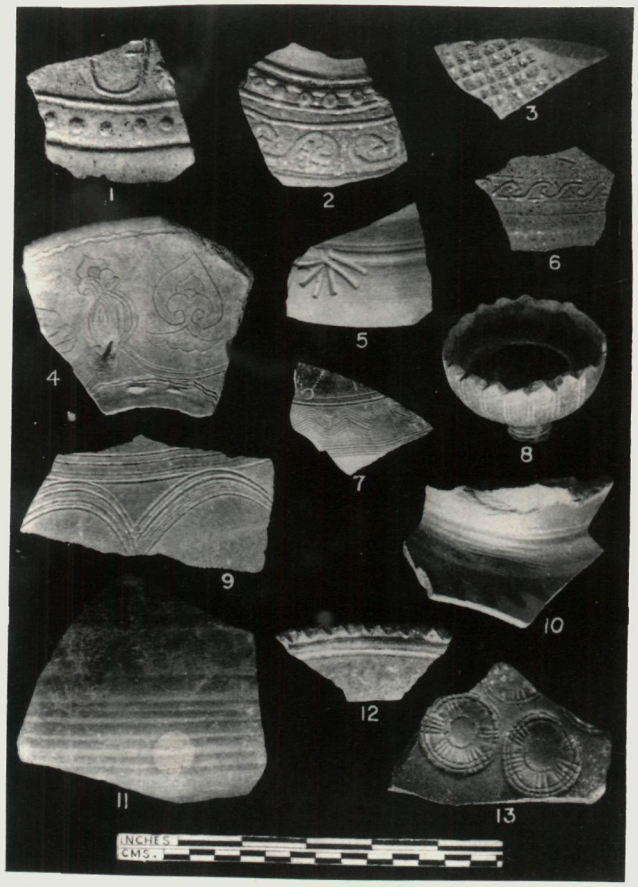
2.4 Hastinapur: Base fragment of Northern Black Polished ware, Painted in black Pigment

2.5 Terracotta female figurine (Kushan Period)

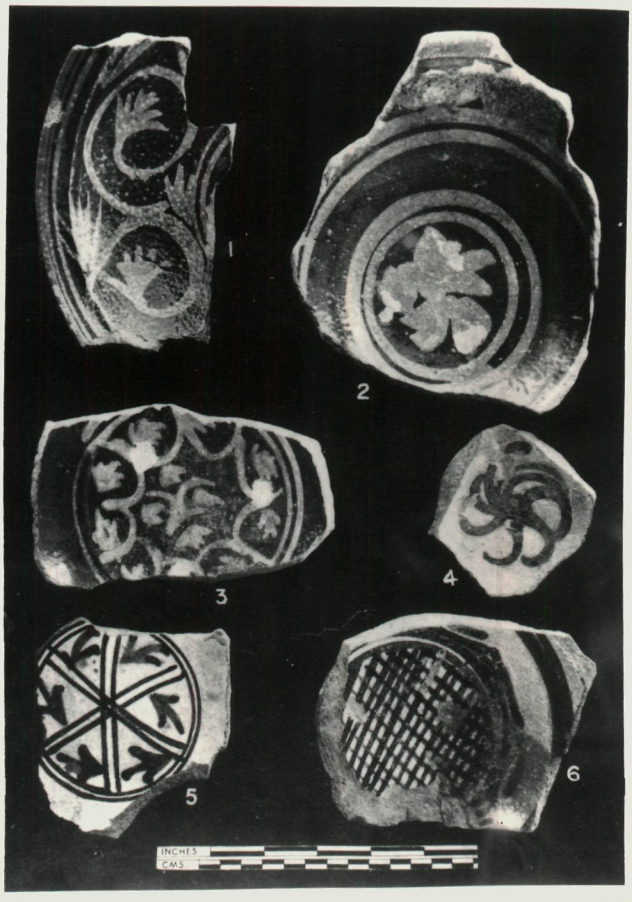
2.6 Terracotta figurine of Bodhisattva Maitreya (Kushan Period)



2.7 Alamgirpur: Sequence of cultures



2.8 Hastinapur:Decorated Pottery (Medieval Period)



2.9 Hastinapur: Glazed ware (Medieval Period)

The beginnings of the history of civilization in the region go back to times considerably anterior to the advent of the Aryans and the rise of Vedic culture.

Aryans gradually cleared up the region, which was previously densely forested, for human habitations. They must have cleared the vegetation along the tributaries of the Ganga and the Yamuna rivers to settle in this region. They must have made their colonies and named these after the name of the chief of their tribes, or clans. By the end of the seventh century B.C., the Aryanisation of the area had been completed[1] and a four tier political organization had been evolved i.e., tribal Kingdom (rastra), containing tribes (jana), tribal units (vish) and villages (grama)[2]. The smallest units of a settlement were the *griha* (house) followed by Kula (habitation of joint family), which was headed by the eldest male member of the family called Kulapa. Villages were the basic units of administration[3] and were generally of three types. The majority of them were those which had grown out of intermixing of Aryan and non Aryan settlers whose main occupation was agriculture. The habitat (Vatsu), around the village deity was surrounded by grama-kshetra (cultivated fields) beyond lay vraja (forests and pasture lands). The second type was the paccanta grama (border village) inhabited by aboriginals or degraded tribes. The third type

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1. Chaudhuri, N.C., *The Continent of Circe*, Bombay, 1965, p. 53.
2. Thaper, R., *A History of India*, Harmonds worth; Penguin Book , (1967), P.37.
3. Dube, S. C. , ' *Indian Village*, London, (1955).

consisted of villages mostly occupied by artisans and craftsman.[1] The houses of the period were made of wood and bamboo and they did not differ much from those found today.[2] Settlements in those days may tentatively be marked of six types, viz., Ghosa or Gopa (cattle ranch), Pali (a small barbarian settlement), Grama (village), Durga (fort), Kharwat (town) and Nagar (city). The latter three of them were associated with urban functions, while the others were rural. Similarly, rural settlements such as ashrama (hermitage), vihara (monastry), Kula (residential place for small family), Kutika (the village under on headman), kheta (a place fortified by an earthen wall), avaksha (rest house) etc., are also mentioned in Mahabharata and Ramayana.[3] The detailed regulations for planned and fortified types of rural settlements are prescribed in the 'Mansara Shilpashastra.[4] According to Havell and R.L Singh the Aryans lived in eight types of planned villages viz., Dandaka (resembling a staff), Sarvatobhadra (happy in all respect), Nandyavarta (abode of happiness), Padmaka (like lotus flower), Swastika Prastava (couch shaped), Karmuka (bowl shaped) and Chaturmukha (having four faces or walls). Location wise these villages are rectangular or square in type and are similar in type. A wall and a ditch

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1. Bose, A.N., '*Social and Rural Economy of Northern India*, Calcutta (1951), pp.35-36.
2. Chatterjee, S.P., 'Evolution of Human settlements in India since the Dawn of Civilization, concepts and Approaches Series 1, in *Contribution to Indian Geography*, (Ed). By R.P. Mishra, New Delh, (1984) PP.216.
3. Acharya, P.K., *An Encyclopedia of Hindu Architecture*, Allahabad, 1964, pp..48 121,127.
4. Singh, L.R., *The Tarai Region of U.P., A study in Human Geography*, Allahabad, (1965), p.32.

for defence purposes surrounded each village. There were generally four gates in the middle of the four sides, thus dividing the village into four quarters. A temple, or a tank or a public hall generally occupied the centre of the village. The four quarters were further subdivided by straight streets, inhabited on the basis of the varnas (particular caste) and professions. The best quarters were generally occupied by the Brahmins and the Kshatriyas (Fig. 4.1). These excavation sites have been searched out mainly from the two journals of Archaeology - Ancient India (Bulletin of Archaeological Survey of India, nos. 10 and 11, 1954 & 1955) and various issues of Indian Archeology - A review. The early history of the region as gleaned from Mahabharata and Puranas, covers the period from Dushayanta and Bharata to the destruction of Hastinapur a few generations after the Mahabharata war. It appears that the Bharatas, one of the most important of the Rig Vedic tribes, were the earliest Aryan people to be associated with this region.

The war, which is generally believed to have taken place between 1400 B.C and 1000 B.C[1], forms the main theme of the great epic, the Mahabharata.

The destruction and desertion of Hastinapur is also corroborated by archaeological evidences which reveals that, great flood in the Ganga,

1. Haig. W. (ed.): *The Cambridge History of India*, Vol. I, 1955, p. 246.

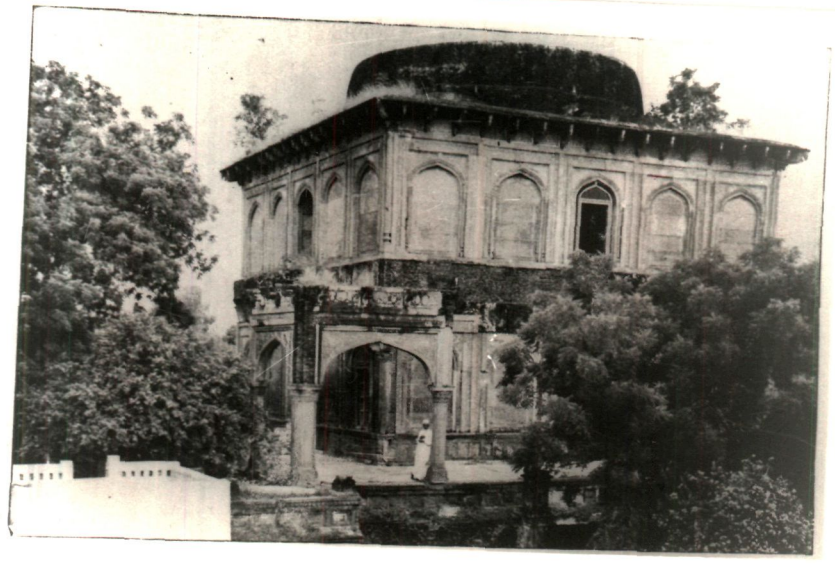
carried away a considerable portion of the habitation. Consequently Hastinapur remained uninhabited for a couple of centuries or so.[1]

About the beginning of the sixth century B.C occupation of the site of Hastinapur is believed to have been resumed by a people who had now ccmpletely given up the 'painted greyware' but had developed another remarkable class of pottery, the 'northern black polished ware; and was definitely iron-using. Among other things punch-marked and uninscribed cast coins of copper and silver and well executed human and animal figurines of terracotta have been discovered from strata at Hastinapur.[2] On its being re-inhabited the city tried to resume its political status and became the seat of government under a branch of the Kurus as this realm has been mentioned among the Solasa Mahajanapadas of the times of Mahavira and Buddha as the kuru-janapada with its capital at Hasinapur which figures as one of the ten capital cities of ancient India.[3] A Digambar Jain Temple was built at Hastinapur about 160 years ago probably on the site of an old Jain temple (Plate No. 2.10).

About the middle of the fourth century B.C the Nanda King put this realm of the Kurus to an end. The Nanda,in their turn, were overthrown by Chandragupta Maurya (circa 324 B.C) who ruled over a vast empire

1. Ancient India, *op. cit*, pp. 14-15, 23.
2. *District Gazetteer*, Meerut, 1965, p. 27.
3. *ibid*, p. 27.

2.10 Digambar Jain Temple, Hastinapur



2.11 Tomb of Saint Shahpir (Medieval Period)

including almost the whole of India.[1] It was towards the end of his successor, Bindusara,that practically the whole of the city of Hastinapur was burnt down in a widespread conflagration.[2] Thus, in the time of the emperor Ashoka (circa 273-236 B.C) Hastinapur was no more in existence, its place having been taken probably by Meerut which had come into prominence- a possibility which is borne out by the fact that one of his famous monolithic pillars was erected in the vicinity of this town, the first six edicts being inscribed on it twenty six years after his coronation.[3] The fabrication of this huge pillar probably at or near Pataliputra and its conveyance 600 miles to Meerut, bears testimony to the skill and resources of the stone-cutters and engineers of the Maurya age.[4]

The Buddhist settlements were in the form of compact villages. Most of the villages had four-ring type of land use pattern the village settlement was surrounded by fields and pastures, beyond which laid the wasteland and jungles. The smallest unit of the settlement was the griha (the house), the habitation of a joint family (the kula). The houses were built mostly of mud, called mattle and daub. According to the size of the villages, they were *gamak* (small village), *gama* (ordinary village), *nigama gama* (big village), *dwara gama* (suburban village), and *pachhanta gama* (urban

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1 . *The History and culture of the Indian people* Vol. II, pp. 58, 61.
2 . Lal .B.B., : "Excavations at Hastinapur and other Explorations in the Upper Ganga and Sutlej Basins 1950-52" --- *Ancient India* (Bulletin of Archaeological Survey of India, Nos. 10 and 11, 1954 and 1955) pp.17-22.
3 . *The History and culture of Indian people* ., Vol . II, pp. 71-72, 78.
4 . *A Comprehensive History of India* , Vol. II , pp. 89,91.

village)[1]. There was a *gramika* (headman) in every village either nominated by the king or elected by *grama vriddhas* (village elders), to manage the affairs of the village and to maintain peace and security.[2]

At the beginning of the second century B.C. Hastinapur was peopled once again and it remained inhabited till about the close of the third century A.D. The material discovered from the strata representing this period generally characterises the Shunga-Kushana level of North Indian sites and proves the existence at that time in this region of an exclusively red ware industry with wheel- turned pots-often having stamped and incised decorations-and of well planned streets with houses built of burnt bricks and equipped with drains, baths, platforms etc. The more important of the findings are iron tools and implements, numerous terracotta figurines, stone artifacts, rings, beads, ivory objects, inscribed pots, clay seals and coins. The art of making moulded and hand moulded terracotta figurines seems to have reached its high water mark in these parts. One of the specimens is the bust of a bejeweled woman of graceful form and features, with a bird seated on her right hand (Plate No. 2.5). Another more remarkable specimen is the torso of the Bodhisattva Maitreya (Plate No.2.6), an excellent piece of art, is the best amongst the other terracottas found anywhere in the country.[3]

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1. Singh, R.L., Evolution of Settlements in Middle Ganga Valley, *National Geographical Journal of India*, Vol. 1, Part II, 1955, p.296.
2. Majumdar, R.C., *Ancient India*, Calcutta,1967, p. 150.
3. *District Gazetteer*, Meerut pp. 28-29.

The numismatic evidence discovered here in the form of five coins of the rulers of Mathura, of which two bear the name of king Sheshdatta,[1] indicating that in the second first centuries B.C., this region might have been included in their dominions. Struck on copper, these coins have observed the Lakshmi figure usually appearing on the coinage of the kings of Mathura of that period.[2] After this dynasty the Mathura kings had been ousted from Mathura by the Sakas about the middle of the first century B.C., the Meerut region seems to have been occupied by the Yaudheyas as the next series of coins discovered from Hastinapur consisting of six "bull and elephant" type. Yaudheya coins which are believed to have been the earliest among the Yaudheya series and may be dated a little before or after the beginning of the Christian era. They had successfully withstood the Saka onslaught but in the second century A.D they appear to have submitted to the Kushanas.[3] Ten imitation copper coins of the Kushana king, Vasudeva believed to have been issued by one of his successors, probably Vasudeva II (circa 210 – 230 A.D) have also been discovered from Hastinapur and are ascribed to about the first half of the third century A.D.[4]

Yaudheyas grew still more powerful in the third century A.D. Then the Gupta emperor, Samudragupta about the middle of the fourth century, overpowered them.[5]

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1 Lal, B.B., op.cit., pp. 22,101,103.
2. *The Cambridge History of India*, Vol. I. p. 474.
3. District Gazetteer, Meerut, p.29.
4. *ibid.*, p. 30
5. *ibid*, p. 30.

During sixth century A.D. the region seems to have been under the rule of Maukharis of Kannauj.[1] In the first half of the seventh century it formed part of the empire of Harshavardhana (606-647 A.D.)[2] After him, for about half a century, anarchy and confusion reigned in northern India.[3] During the first half of the eighth century the region was included in the dominion of King Yashovarman of Kannauj.[4]

About the middle of eighth century a dynasty of Tomara Rajputs established itself at Delhi and its rulers seem to have extended their sway over the adjoining region of Meerut.[5]

During the ninth and tenth centuries the greater part of northern India was under the empire of the Gurjara Pratiharas of Kannauj.[6] In the latter half of the tenth century, however, the power of the Gurjara Pratiharas began to decline rapidly, taking advantage of which the Tomaras probably become independent. But they soon came into conflict with the Chauhans of Shakambhari. In this confusion Haradatta, a Dor chieftain, captured Meerut and Koil, and built the famous fort of Meerut.[7]

The historian Firishta says that Mahmood of Ghazni, in his ninth expedition (about 1019 A.D) captured this place but its ruler, Haradatta, for

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1. *The History and culture of the Indian people*, Vol . III, p.68.
2. *ibid.* , pp. 112-113.
3. *ibid.* , p, 124.
4. *ibid.* , pp. 128-131.
5. *ibid* . , Vol. IV. p.110
6. *ibid* ., Vol. IV. p. 32,110.
7. *The History and culture of Indian People*, Vol. IV, pp.38, 111.

25,000 dinars and fifty elephants, ransomed it.[1] According to a local kamboh tradition, Hasan Mahdi built the Jama Masjid of Meerut in 1019 A.D.[2]

The region appears to have remained immune from Muslim invasions till the Dor Rajas, the successors of Haradatta, held 1192 when its greater part, particularly that of the southwest. The Tagas had long held the northern part.[3] The Jats who entered the District in the north- west drove the Tagas to the south and east.[4]

Inspite of the prolonged Tomara Chauhan struggle the Tomaras continued to rule from Delhi till about the middle of the twentieth century when they were completely overthrown by the Chauhan King Vigraharaja III, Visaladeva of Ajmer and Shakambhari.[5] Form the village of Rataul a broken copper plate inscription was discovered about seventy-five years ago, its donor being said to have been Chahadadeva, the chief here apparent of the Lord of Shakambhari.[6] The two big stone images of Jain tirthankaras were discovered from the jungle near Hastinapur installed in 1176[7], lend support

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1. Atkinson, E.T:- *Statistical, descriptive and Historical Account of the North Western Provinces of India*, Vol. III. Meerut Division , (Allahabad, 1876), pp. 320, 414.
2. Fuhrer, A.: *The Monumental Antiquities and Inscriptions in the North Western Provinces and Oudh*, Allahabad, 1891, p.11.
3. Atkinson, op.cit., p. 320.
4. *Ibid.*, pp. 264,507-510.
5. *The History and Culture of the Indian People* , Vol. IV, p. III.
6. *District Gazetteers of the United Provinces of Agra and Oudh Supplementary Notes and Statistics.* B. Vol. - Meerut (Allahabad, 1917), pp. 18-19.
7. Jain, J.P., Hastinapur, Lucknow, 1955, p.11.

to the view that after conquering Delhi the Chauhans extended their sway over parts of Meerut District.

At the time of Prithviraja of Delhi the power of the Dor Rajputs began to wane, and subsequently they were dislodged with the help of Mina Meos from the south of Meerut by Govind Rao [1].

A few months after Prithviraja's defeat in the battle of Taraori on Meerut and laid siege to its fort.[2] Invaders captured the fort and the region Meerut became their first outpost in the region. Some temples were converted into mosques.[3] A mosque built by Qutd-ud-din still bears his name.[4] A coin of Balban (1266-1287) has also been discovered in the excavations made at Hastinapur.[5]

When marching from Kara to capture the throne of Delhi, Ala-ud-din Khalji's progress was impeded near Baghpat in 1296 as the Yamuna was in spate.[6]

During the reign of Muhammad-bin-Tughlaq, Tarmashirin, a powerful Mongol chief, invaded Meerut in 1328-29. But was defeated.[7]

When on a hunting expedition about the year 1364 Firoz Shah Tughlaq's attention was attracted by the famous Ashoka pillar standing in

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1. Atkinson, op, cit. , pp. 258-259, 265.
2. The Cambridge History of India, Vol. III, pp. 40-41.
3. Hasan Niazmi: Taj-ul-Maasir (English translation of extracts by Elliot and Dowson, op. cit., Vol, II, p. 219).
4. Fuhrer, A. op.cit., p.11.
5. Ancient India: Bulletin of the Archaeological Survey of India, Nos. 10 and 11, 1954 and 1955.
6. Ziya-ud-din Barani: Tarikh-i-Firuzhahi (Khalji Kaleen Bharat, p. 44).
7. District Gazetteer Meerut , p. 35

the vicinity of the town of Meerut, he ordered its removal to Delhi where it was re-erected in the Kushk-i-Shikar.[1]

In 1390 Muhammad Shah Tughluq, for interning Abu Bakr, his nephew and rival, used the fort of Meerut as a state.[2]

Timur, king of Samarqand and the most powerful of central Asian monarchs of his times, made a plundering expedition into India in 1398 and, devastating the territories which he traversed and Meerut was not the exception. After his departure in January 1399 Meerut became for a time the headquarters of a pretender to the throne of Delhi.[3]

During the regime of the Saiyid Kings (1414-51) the whole of the doab remained in a state of turbulence and towards the end of the period the region from Sambhal to Loni was held by Darya Khan Lodi.[4] The District remained in their possession but after the battle of Panipat in 1526 it was passed into the hands of Babur. In 1540 Sher Shah Suri defeated Humayun at the battle of Kannauj and conquered the kingdom of Delhi. In 1555-56 Humayun got back the throne of Delhi.[5]

In the days of Akbar almost the whole of the present District of Meerut was part of the subah of Delhi, all the present day parganas except that of Sardhana was included in the Sarkar of Saharanpur, being included in the Sarkar of Delhi. The mahals of Meerut, Barnawa, Hastinapur,

1. *ibid.*
2. *ibid.*
3. *District Gazetteer*, Meerut, pp. 36-37.
4. ibid.
5. Abul Fazl : The Akbarnama, translated into English by H. Beveridge, vol. II, p.71.

Sarawa, Garhmukteshwar, Hapur and Jalalabad formed part of Meerut. The mahal of Sardhana formed a separate unit and included a large portion of the present district of Muzaffarnagar. The mahals of Loni, Dasna, Baghpat, Baraut, Kotana, Chhaprauli and Tanda Phugana were included in the dastur of Delhi and mahal Puth in the dastur of mahal Baran (Bulandshahr).[1]

In the early days of Jahangir's reign Izzat Khan was in charge of Jalalabad. The queen, Noor Jahan, is said to have been a devotee of Shah Pir, a noted Muslim saint of Meerut, on whose grave she got erected about 1620 a mausoleum of red sandstone, which is still in existence[2] (Plate No.2.11). In Shah Jahan's time Najabat Khan Shuja held Meerut and Saharanpur. A number of places in the districts were presumably named after the emperor Aurangzeb or his title of Alamgir.[3]

During the time of the Mughals a mint for copper coins was located in the town of Meerut. Several places in the District were the favourite resorts of the Mughal nobles who often went on hunting expeditions in the Ganga khadar.

In 1739 Nadir Shah of Iran invaded India and sacked Delhi, causing disruption and conditions of anarchy in the neighbouring districts including Meerut.[4]

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1. Abul Fazl: *The Akbarnama*, translated into English by H.S. Jarrett, Vol. II, pp. 291 - 293, 297.
2. Fuhrer, A: *op. cit*, p. 11.
3. *District Gazetteer*, Meerut, p. 40.
4. Banerjee, B., Begum Samro, p. 12.

Najib-ud-daula became the ruler of entire District of Meerut in 1760. In 1774 Najaf Khan acquired Meerut from Zabita Khan (Najib-ud-daula's son and successor).[1]

After four years Najaf Khan conferred in Jagir the pargana of Sardhana on his European commander, Walter Reinhardt Sombre, which yielded revenue of six lakhs of rupees[2]. Sombre selected the town of Sardhana as the seat of his extensive estate. On his death the estate passed into the hands of his window. After three years she became a Roman Catholic and was baptised Joanna.[3] The Roman Catholic have their headquarters in Sardhana Begum Samru adopted the Roman Catholic faith of which she proved to be the greatest if not the only known portion in northern India, Sardhana, her seat is a focus of Roman Catholic activities possessing a school, a college and a Church, all directly or indirectly the result of her testamentary bounty (Plate No.2.12 and 2.13).

In the nineties of the eighteenth century, Begum Samru became a leading figure at the imperial court. George Thomas successfully established peace in her territories.[4] The begum had always adopted a friendly attitude towards the English.[5] About the middle of the eighteenth century, Jit Singh, a notorious Gujar chief, had become so powerful that he

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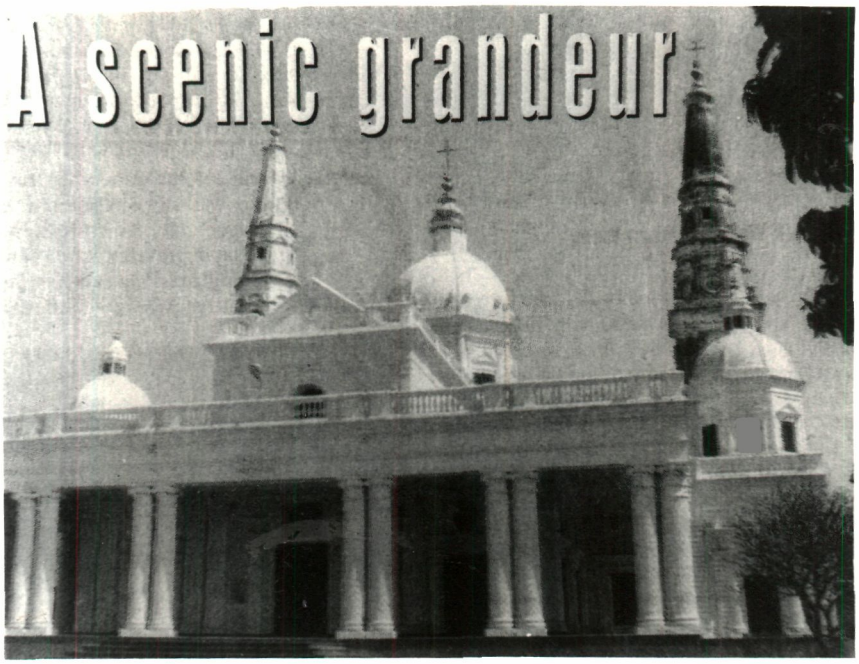
1. *District Gazetteer*, Meerut , p.40.
2. Banerjee, B., Begum *Samro*., p. 12
3. *District Gazetteer*, Meerut, p.44.
4. Banerjee, B, op. cit., p.18.
5. *District Gazetteer*, Meerut, p. 45.

Roman Catholic Church, Sardhana

2.12 Roman Catholic Church, Sardhana (Medieval Period)



2.13 Façade of the Begum's Palace, Sardhana (Medieval Period)

controlled a considerable number of the forts in the District.[1] He was succeed by his nephew, Nain Singh, who assumed the title of raja, and to whom the Marathas also granted over three hundred villages some of which lay in the District. When the British occupied the District in 1803 they also recognized his authority over his estate on the same terms, which the Maratha had granted him, this arrangement to last only during his lifetime.[2]

In 1805, the British decided that the jagir of Sardhana would remain in the Begum's possession during her lifetime but she had to surrender half the strength of her troops to the British.[3] In 1816 the Meerut was constituted into a separate District.

After the conquest of the doab by the British the District of Meerut passed through several administrative changes, assuming its present shape in 1853.[4] In 1844 W.H. Sleeman visited the District and he had observed in his memoirs." The country between Delhi and Meerut is well cultivated and rich in the latent power of its soil, but there is here, as everywhere else in the Upper Provinces, a lamentable want of gradations in society from the eternal sub-division of poverty in land, and the want of concentration of capital in commerce and manufacturer".[5]

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1. *ibid.*,
2. *District Gazetteer*, Meerut, p.47.
3. Banerjee, B, *op. cit.*, pp. 103-104.
4. *District Gazetteer*, Meerut, p. 48.
5. Sleeman, W.H. *Rambles and Recollections of an Indian Official* , edited by Vincent A. Smith, (oxford, 1915), p. 571.

At the close of 1856, Ahmadullah (Popularly Known as the Maulvi of Faizabad) stayed for some time at Meerut and preached the gospel of political freedom to the Indian soldiers. At the time of outbreak of the struggle for freedom the revenue division of Meerut comprises of the Districts of Meerut, Aligarh, Bulandshahr, Dehradun, Muzaffarnagar and Saharanpur.

Before annexation, the zamindars fought bravely against the British to save the country and as a result political confusion prevailed in the area, which led the rural population to congregate in large villages for security purposes.

After the British occupation of the territory, the rural areas underwent significant changes in settlements. Several roads were constructed to connect important places for convenience in administration. They also constructed hospitals, dakbungalows, public schools, circuit houses, District and local boards.

The department of revenue administration prepared detailed large maps of rural settlements, showing individual agricultural plots, inhabited sites, roads, water bodies, forest etc. The village life became peaceful.

The advent of modern means of transport and communications in the form of railways and roadways added much to the growth of settlements in the area. The first railway line passing through the Meerut District was

opened in 1864. In 1875, there were 194 miles of metalled roads in the District.

By the beginning of the twentieth century, the chief industries were the leather industry, cotton weaving, blankets manufacturing, pottery making etc. The cultivation of indigo and manufacture of dye goes back to pre-British times but the industry began to languish after the British occupation of the region. Trade developed rapidly after the construction of metalled roads. The impact of railways was much greater and export of food-grains, oilseeds, raw cotton etc was made possible.

Ancient highway leading from Pataliputra to Takshashila passed through Hastinapur and Meerut. Many sarais are still found in this region. Aminnagar sarais in Baghpat is an example. There are three series in the city of Meerut, the Pakki (in Valley Bazar), the Smithganj and the Muftiyan (near Shahpir Gate).

The British developed the city of Meerut in the north. Its modern growth started with the establishment of a military cantonment, and with its elevation as District and regional head quarter.

Remarkable changes were brought about in the nature of dwellings. The British organized permanent settlements and dwellings by restricting shifting cultivation. Around early 20th century the village boundaries were demarcated with flagstones. Extension of the network of modern means of communication and abolition of zamindari system etc. encouraged further

development of rural settlements in the area since Independence. The diversified and rapid development of small scale and other industries in the region has also been appreciable only after the attainment of Independence in 1947. Important focal points are Modinagar, Hastinapur and Meerut itself. Since Independence, the Meerut city has experienced a new phase of all round growth with consequent rise in urban population and spread of the city towards the periphery, where several new colonies with modern amenities have sprang up. Recently the establishment of the Meerut University has raised its educational status. The new administrative institutions like Development Blocks and village Panchayats and Public buildings belonging to primary schools, rural health centres, pachayat bhawans, community centres etc. have contributed a lot to a change in the rural landscape of the study area. A large number of new settlements have grown up around these centres.

Recently consolidation has resulted in the origin of individual family houses, which have added to the built-up area of the village. Another change in settlement patterns is the more rapid development of brick built houses as compared to the mud, thatch and tile roofed houses in the region.

4.0 DIFFUSION OF SETTLEMENTS

The study of spatial diffusion occupies a central place in geographical researches. The word diffusion from the verb 'diffuse' means

to disperse or is dispersed from a centre; to spread widely, disseminate (The Oxford English Dictionary).

The work on cultural as well as settlement diffusion could be traced in the frontier thesis of Turner[1] in American history, Bowman's[2] Pioneer Fringe and Zoerg's[3] Pioneer settlement: Cooperative studies-the classics of that period. During thirties sauer and Brand[4] (1930) collected archaeological evidences from pueblo-sites and attempted to deduce the culture areas and successions in southeastern Arizona. Stanislawsky[5] (1946) traced the diffusion of the grid pattern in the Americas. The cultural diffusion idea was propounded by sauer[6] at world scale. Mitchell and Sandner in 1954, 1961 respectively. (1952). Chisholm[7] (1962), however, emphasized four major changes affecting diffusion of new settlements. Firstly, socio-economic changes in land-holding system help in dispersion of settlements, secondly removal of the need for defensive agglomeration which lead to hamletization in several parts of India, thirdly, elimination of such factors like lack of water and disease etc. as improvements in water supply attracted settlers in canal irrigated areas in Rajasthan and Haryana

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1. Turner, F. J, *The Frontier in American History,* New York, 1920.
2. Bowman, I., *The Pioneer Fringe*, American Geographical Society, New York, 1931.
3. Zoerg, W.L.G. (ed.), *Pioneer Settlement*, American Geographical Society, New York, 1932.
4. Sauer C.O. & Brand D., *"Pueblo Sites in South Eastern Arizona"*, University of California, Publications in Geography. Vol. 3, 1930, pp.415-48.
5. Stanislawsky, D., 'The Origin and Spread of the Grid Pattern Town, *Geographical Review*, Vol. 36, 1946, pp. 105-120.
6. Sauer, C.O., *'Agricultural Origins and Dispersals'*, Bowman Memorial Lectures, American Geographical Society, New York, 1952.
7. Chisholm, M.D. *'Rural Settlement and Land Use*, London 1968, p. 99.

and malaria free zone of Tarai region in Uttar Pradesh. Fourthly the systems of land holdings are mainly responsible for diffusion in industrialized areas. Singh (1968) analyses the spatial diffusion settlements in eastern Uttar Pradesh through physico-cultural forces[1].

4.1 Models of Diffusion

An important contribution in the field of settlement diffusion has come from Bylund[2] while considering the distribution of settlements in Lappland (Sweden), he made an attempt to place settlement expansion within a deterministic framework and suggested the ways in which 'waves' of settlements moved within study area. Assuming that the physical conditions of the land are similar in areas and further area will not be occupied until those close to the parent settlements, have been occupied. He presented four hypothetical models of settlement diffusion (Fig. 2.5). Each models assumes a four-phase sequence but the number and locations of original settlements differ; while first and last models assume spread from coastal locations.

4.2 Spatial Diffusion of Rural Settlements

This Bylund's model is highly suited in Indian climatic conditions. The progress of colonization has been discussed through five stages corresponding to cultural periods represented by various ceramic assemblages:

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1. Singh. K.N., The Territorial basis of Medieval town and village settlement in Eastern Uttar Pradesh, India, *Annals, A.A.G.*, Vol. 58, 1968, pp.203-220.
2. Bylund, E., ' Theoretical Considerations Regarding the Distribution of settlement in Inner North Sweden', *Geografisca Annaler*, Vol. 42, pp. 1960,225-231.

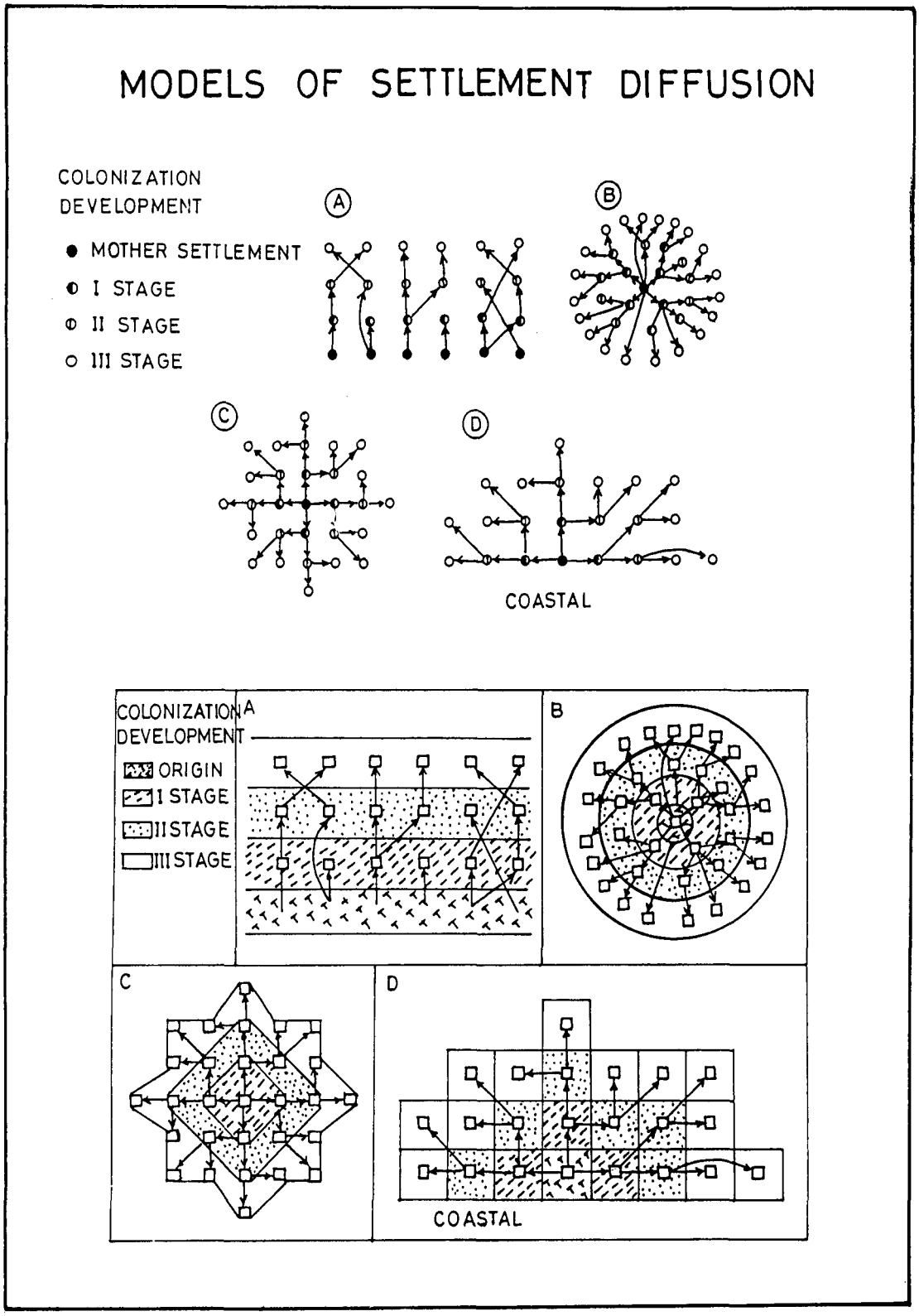
MODELS OF SETTLEMENT DIFFUSION
COLONIZATION
DEVELOPMENT
MOTHER SETTLEMENT
I STAGE
II STAGE
III STAGE
A
B
C
D
COASTAL
COLONIZATION
DEVELOPMENT
ORIGIN
I STAGE
II STAGE
III STAGE
A
B
C
D
COASTAL

FIG. 2.5

(i) Initial stage of human colonization.

(ii) First stage of human colonization Pre 1200 B.C.

(iii) Second stage of human colonization (B.C 1200-200 B.C)

(iv) Third stage (early 2nd B.C – Late 3rd A.D)

(v) Fourth stage (Early 11th A.D – 1857).

The Aryan colonists from their first settlements in the Punjab gradually migrated southeast and eastwards down the Ganga valley (2500-2000B.C) in perhaps two principal branches: One branch moved eastwards and established in the Ghaghara valley in Avadh with its capital at Ayodhya (near Faizabad) while the second branch moved along the Ganga and first occupied the Yamuna Ganga doab. Gradually the whole region got colonized into petty kingdoms comprising numerous villages (Fig. 2.6).

I. Initial Stage of Colonization

The initial stage of the colonization of the doab is represented by the use of Late Harappan Pottery. In the study area only one settlement has been found at Alamgirpur on the west bank of river Hindan about 16 miles west of Meerut city of the Late Harappan. Even for doab nearly 70 settlements have been found, mainly confined to the tributaries in the upper doab. No settlement has been found along the two major rivers i.e., the Ganga and the Yamuna. The settlements are generally located on the higher banks of the rivers and are small in size, although a few of the larger ones are up to 4 hectares in area. The size of the settlements indicates a resident population of between 50 and 500. The average spacing between

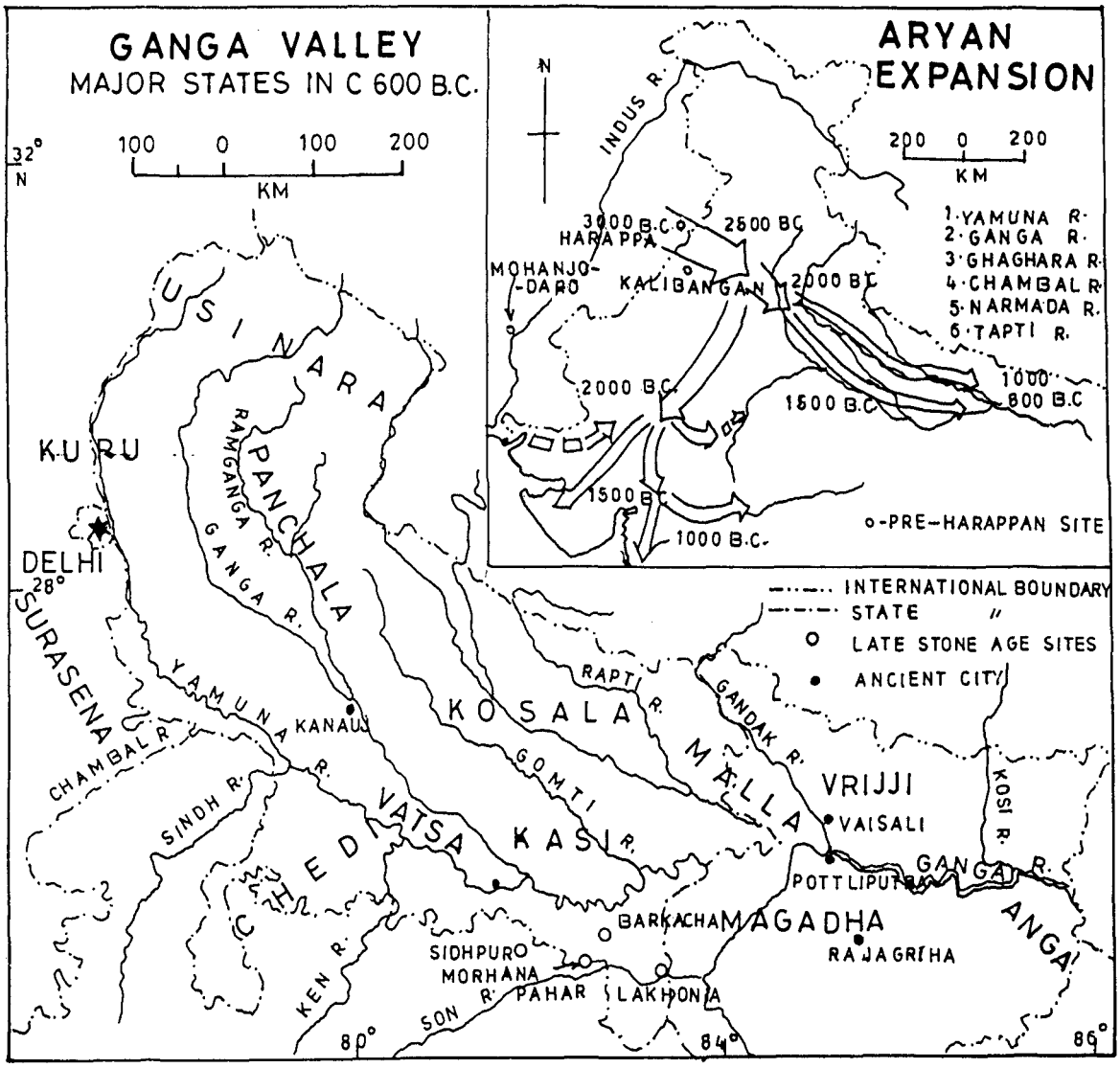
GANGA VALLEY
MAJOR STATES IN C 600 B.C.
100 0 100 200
KM
32° N
28°
86°
KURU
DELHI
USINARA
PANCHALA
SURASENA
RAMGANGA R.
GANGA R.
YAMUNA R.
KANAUJ
CHAMBAL R.
SINDH R.
KOSALA
GOMTI R.
KASI
VATSA
CHEDI
KEN R.
SIDHPURO
MORHANA
PAHAR
BARKACHA
LAKHONIA
SON R.
RAPTI R.
GANDAK R.
MALLA
VRIJJI
VAISALI
KOSI R.
POTTLIPUTRA
GANGA R.
MAGADHA
RAJAGRIHA
ANGA
ARYAN EXPANSION
INDUS R.
N
200 0 200
KM
3000 B.C.
HARAPPA
2500 BC
MOHANJO-DARO
KALIBANGAN
2000 BC
1500 B.C.
1000 B.C.
1. YAMUNA R.
2. GANGA R.
3. GHAGHARA R.
4. CHAMBAL R.
5. NARMADA R.
6. TAPTI R.
o-PRE-HARAPPAN SITE
INTERNATIONAL BOUNDARY
STATE "
LATE STONE AGE SITES
ANCIENT CITY

FIG. 2.6

the two settlements in the doab and in the Gangetic divide was almost the same between 8 and 12 Km[1]. The limited thickness of the cultural deposits (1 to 2 m) indicates that the settlements were of short duration.

II. First stage of Human colonization

Almost contemporary to the Late Harappan nearly 110 settlements known belong to OCP in doab [2]. The distribution area is larger than the late Harappan.

In contrast to the Late Harappan, which is confined only to the upper doab, OCP settlements are found in the middle doab as well. A few settlements have been reported also from the lower doab. In case of study area i.e., Meerut District six sites are important, (Fig. 2.7). The settlements are located on the riverbanks and in size and spacing are like the Late Harappan settlements. Only in some cases the spacing is comparatively less – between 5 and 8 Km. The cultural deposit is once again shallow (0.5 to 1.5 m) indicating the short duration of settlements. The various excavations in doab show that OCP deposits at these sites were mixed with brown earth, kankar and sand, which during excavations came out in lumps. The state was quite disturbed and no sign of regular habitations was found. Lal (1968), considering the nature of deposits at various sites, reveals that during OCP a big flood occurred and the entire Ganga Yamuna doab got converted into a big artificial lake for a considerable period.

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1. Suraj Bhan., *Settlement patterns of the Protohistoric cultures of Haryana*, Paper presented at seminar on " Indus Civilization : Problems and Issues:, Simla, 1977.
2. Lal, M., *Settlement History and Rise of Civilization in the Ganga Yamuna Doab*, New Delhi, p. 28, 1984.

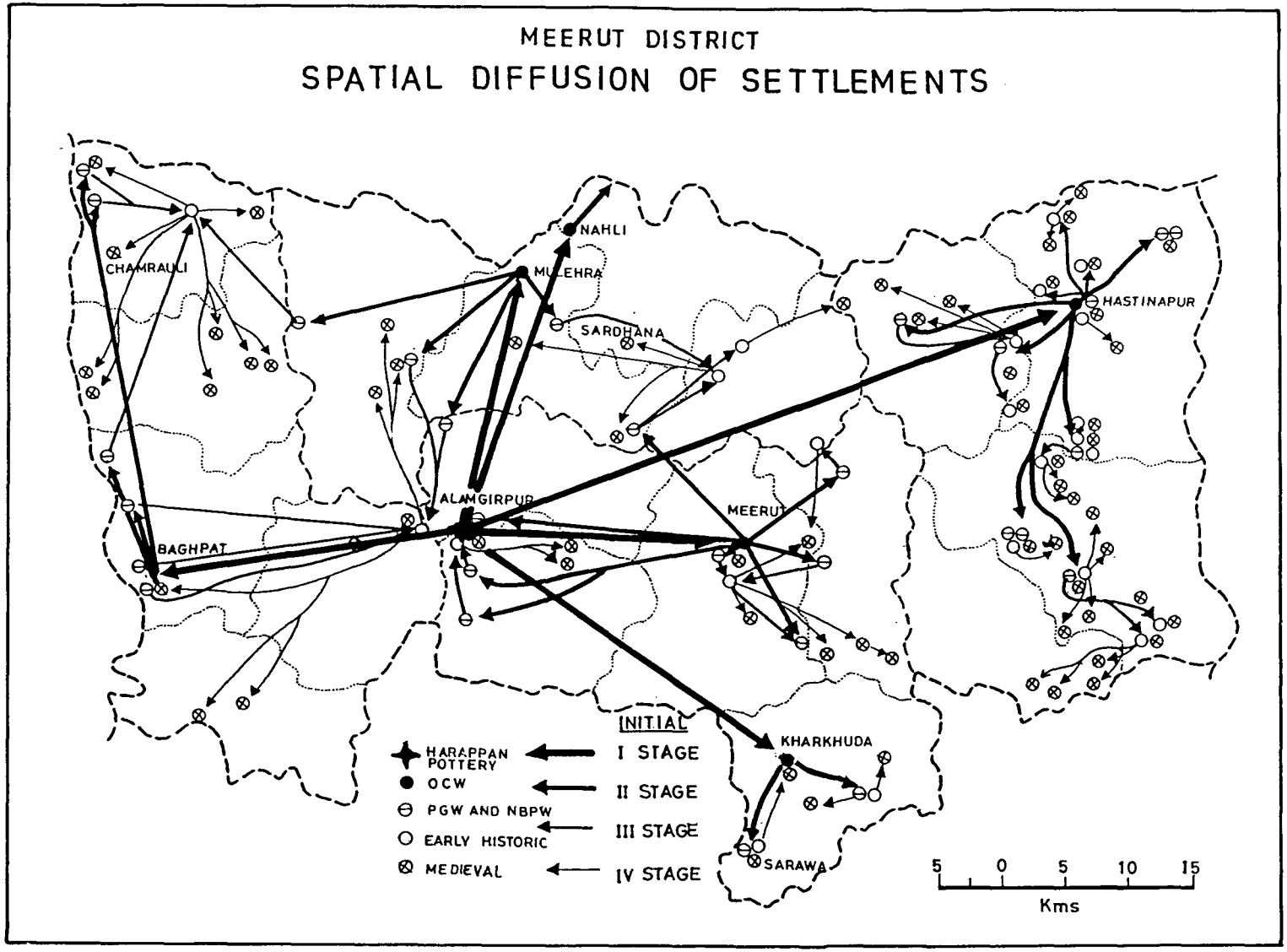
MEERUT DISTRICT
SPATIAL DIFFUSION OF SETTLEMENTS
NAHLI
CHAMRAULI
MUZEHRA
SARDHANA
HASTINAPUR
ALAMGIRPUR
MEERUT
BAGHPAT
KHARKHUDA
SARAWA
INITIAL
HARAPPAN POTTERY
I STAGE
OCW
II STAGE
PGW AND NBPW
III STAGE
EARLY HISTORIC
MEDIEVAL
IV STAGE
5 0 5 10 15
Kms

FIG-2.7

III. Second Stage of Human Colonization

The second stage of colonization is represented by the painted Grey ware (PGW) and Northern Black Polished ware (NBPW). At this stage settlements extended beyond the boundaries of the first stage. Now the settlements are found all over the doab. They are also found on major rivers as well as on the tributaries. Nearly 90% of settlements are on the riverbanks.[1]

During the second stage of colonization rivers played an important role in the selection of sites. The settlements in the area of inundation are on the high terraces, overlooking the river and its vast flood plain. The terraces vary in height and steepness from a series of undulations to more or less level patches of cultivation. These patches are often inundated, providing fresh alluvial deposits rich in nutrients and are extremely good for cultivation. The evidence of flooding of OCP deposits shows that they were subjected to periodic flooding. The colonizers of the second stage seem to have learnt from this experience. This may explain why on the Ganga we find settlements only on the higher bank and not along the flood plains. On the tributaries the settlements are found on both banks. This can be explained by the fact that tributaries may have levees and flood plains an either bank. When there is a levee on the right bank the flood plain lies in

1 . Lal, M. , *op. cit.*

front of it on the left bank and at some distance the position reverses, i.e. a levee on the left bank and flood plain on the right.

The size of settlements during this stage on the Ganga was sometimes as big as 8 hectares. When settlements on the tributaries reached a size of 2 to 3 hectare (400 to 600 Population) there was a tendency towards fission. They could not grow bigger as did the settlements on the Ganga. The fission of settlements on the tributaries was perhaps due to the non-availability of sufficient good agricultural land in their vicinity. Further, the soils along the tributaries are not as fertile as the soils along the Ganga. This would have not only given fewer yields but also demanded a longer fallow period to regain fertility. Smith (1972)[1] explains that settlements of long fallow cultivation tend to be small, though the total population in the region may be large. The basic concept is that the long fallow cultivation does not so much limit the size of total population (within the limits of the environment's carrying capacity) as limit the size of local units. The presence of large nucleated settlements on the Ganga is probably due to the greater availability of good cultivable land and shorter fallow periods.

The settlements, which are away from the rivers during this stage, are near large low-lying swampy areas, which were regular lakes in the

1. Smith, P .E .L., Landuse, Settlement Patterns and Subsistence Agriculture : A demographic perspective. In *Man, settlement and Urbanism* , ucko, P. J., R. Tringham and D.W. Dibleby (eds.), London, 1972 ,pp. 409-25.

past[1]. On all these lakes sites of this stage have been found. Infact, the whole of the doab is dotted with such lakes. The location of settlements besides them must have been due to the availability of water, aquatic food from the lakes and soft fresh alluvial soils around them. But in comparison to the riverside settlements the habitational deposit on lakeside settlement is less, showing that at the initial stages settlers might have faced disadvantages being away from the rivers and therefore perhaps deserted the site sooner.

The size of nearly 80% of the settlements remained small, having a population of less than 500. Only 20% of the settlements are big enough to accommodate a population of between 500 and 1000 or in a few cases even more. In the later phase of the colonization (600-400 B.C) three to four city sites may have accommodated 10,000 people or more. It can be safely inferred that not only the geographical area of colonization was larger during this stage but also the settlements were comparatively greater in size. The average spacing of settlements during this stage varied between 13 Km in the beginning to 6 to 8 Km in the later stage. It may be pointed out that the average spacing between two settlements on the Ganga, Rind, Pandu, and Sasur Khaderi etc. was much less (5 to 7 Km) than the spacing on rivers like the Hindan, Kali and Sengur, where spacing is between 8 and 13 Km.

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1. Various census reports and Gazetteers of the second half of nineteenth and first half of twentieth century.

The lack of settlements on the Yamuna, especially downstream of Agra, and the sparseness of settlements on Sengur can be partially explained by the presence of Kankary ravines, which extend upto 5 Km away from the riverbanks. The soils along these rivers are most unpromising and this results in sparseness even today. Downstream from Agra only three settlements worth mentioning have been found on the Yamuna. Musanagar (Kanpur District), Reh (Fatehpur District) and Kausambi (Allahabad District).[1] Infact, no ancient city or town was located between Agra and Kausambi, a distance of nearly 600 Km, while within the same distance on the Ganga many ancient cities and towns were situated. It is important to remember that even in modern times no significant city or town has developed on the bank of Yamuna in the above-mentioned stretch. Thus it can be safely concluded that the relative unattractiveness of the Yamuna continues from ancient times.

IV. Third Stage (200 B.C – 300 A.D)

This stage of human colonization is represented by the early historical period archaeologically represented by Red Slipped ware. A significant change took place during this stage of colonization. The settlements extended beyond the range of location of previous settlements. A substantial number of settlements are now found away from the rivers

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1. Lal, M., *The Development and Dispersal of Agricultural settlements in the Ganga-Yamuna Doab (2nd and first millennium B.C).* Paper presented in Indian History congress, Goa, 1987.

and lakes (Fig. 2.7). The increasing pressure on the soil along the rivers and the lakeshores must have been one of the factors in the movement of people away from the rivers. The linear expansion of settlements has its own limitations and beyond a certain point settlements develop a momentum for circular and curvilinear growth, particularly when backed by habitable and cultivable land[1]. In other words, the increase in population along the river banks leads not only to the enlargement of settlements and intensive cultivation on the land around them, but also to the expansion of population in neighbouring areas. Besides, better technology in the form of increased and improved iron tools, and more organized efforts on the part of the community and state must have helped people to open new areas for settlement.

The tendency towards the splitting of settlements along the tributaries after reaching a size of 3 to 4 hectare continued. The causes of this division must have been the same as during the earlier period. However, it must be emphasized that in general the settlement size increased, sometimes reaching as much as 15 hectares. The maximum number of settlements located away from the rivers and lakes are on good soils, which are well drained and can be profitably managed for agricultural purposes. The patches of usar and marsh have been avoided. One

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1. Doxidis, C.A. "The future of Human settlements" in *The Place of Value in a World of Facts*, eds. Tiselius, A and S. Nilsson , Stockholm : Almquist and Wiksell, 1969, pp. 307-338.

noticeable feature in their location is that in the late period of this stage settlements also started appearing in less hospitable areas along the yamuna, indicating that an increase in population in some areas must have forced people to colonize areas previously not very much favourable. The average spacing between two settlements during this stage of colonization was 7 to 9 Km. As in the previous stage, once again settlements are more closely spaced.

At this stage of colonization cities came to be fully developed. Monumental building came into existence and burnt bricks came to be used very widely. A few cities were well planned, arts and crafts increased and long distance trade flourished. In terms of political power this stage of colonization witnessed one of the biggest empires of the ancient world, i.e., the Mauryan empire.

V. Fourth Stage (1175 A.D - 1856 A.D)

The next phase in the cultural evolution of the study area started with the arrival of Muslims in the eleventh century. They constructed several forts and several trade centers. Muslims particularly Mughals built several mosques at several places. Very few settlements were developed during this period, but they changed the names of old settlements.

Some of the places were administrative head quarters and a few developed as trade centres. During this period, several roads were developed in the study area. It is observed that several periodic markets

and fairs were developed, which gave rise to new settlements in the area. Most of the fairs were arranged in the winter and summer seasons so that the roads and cart tracks could be used for the movements of goods and people. These socio-economic conditions favoured the growth of several new settlements in the study area.

The above discussion reveals that there has been a definite pattern in the diffusion settlements during successive cultural periods. In the initial stage the settlements were confined to the tributaries. No settlement has been found on the banks of two major rivers i.e., Ganga and Yamuna. In case of the first stage the settlements are generally located on the rivers banks but a few settlements have been found away from the rivers as well. During second stage of colonization are found on the major rivers and on the tributaries as well. In this stage settlements were found in the entire doab and subsequently diffused to the sited of lakes. In the third stage intensive colonization of new areas took place. The settlements diffused from the main from sites, i.e., rivers and lakes to well drained and less hospitable areas in the doab. It is inferred that pressure of population was realized for sustenance. During the fourth stage the some of the settlements were sprung up in the form of administrative quarters. To carry out the socio-economic need of the existing settlement, roads, market fair sites and other social amenities were developed. These developments further stimulated the growth of settlement all along and near the sites in the study area.

CHAPTER III

SPATIAL DISTRIBUTION OF RURAL SETTLEMENTS AND THEIR TYPES

CHAPTER 3

SPATIAL DISTRIBUTION OF RURAL SETTLEMENTS AND THEIR TYPES

The settlement is a system of complex organization with man and his occupance units. It is a man made habitat on the earth's surface representing an organized colony of human beings including the buildings in which they live or work or store or use them otherwise, and the tracks and streets over which their movements take place [1]. The occupance of rural landscape is the outcome of diverse physico-cultural, socio-economic and historical factors of the region. The distribution of settlements is defined as the frequency with which they occur in a given place. A rural settlement is relatively small and simple agglomeration of houses at a favourable site primarily associated with agriculture and related processes. Such settlements vary from region to region in types and in patterns of distribution, and each one of these settlements is unique having its own personality. However, in the present study general conclusion from specific facts and indices of measurements have been made to interpret the distributional pattern and interrelationship among the rural settlements with the help of size (population and area), spacing (observed, expected and

1. Singh, R.L., 'Meaning, Objective and Scope of Settlement Geography'. *National Geographical Journal of India*, Vol. 7, (1961), pp. 12-20.

index of randomness), and other characteristics. On the basis of these findings an attempts has been made to measure the degree of concentration and dispersion and to classify the rural settlements in to different types.

1.0 RURAL AREA / VILLAGE AND HAMLET

Though the village has been important form of the settlements fabrics of each and every country of the world from the ancient times, yet no universally acceptable definition has so far emerged. The term 'village or rural area' is usually refers to revenue *mauza* as defined in 1961 Census, according to which a rural area, generally follows the limits of a revenue village, which has a definite surveyed boundary and is a separate administrative unit of separate village accounts. It may have one or two hamlets, each bearing a different name. Thus a village is a tract of land, inhabited or not, which has been demarcated as a unit for revenue purposes[1]. It may be identified as a human aggregation with a definite position and area bearing a particular place-name and usually surrounded by agricultural lands associated within its territory. In the study area a village includes a cluster of houses or more than one such cluster. The main inhabited site is known as Khasgaon or Abadi Khas, while it may have one, two or sometimes more hamlets distinguished by different names,

1. S.C. Srivastava, *Indian Census in Perspective*, Census of India 1981, New Delhi, (1972), pp. 198-99.

generally suffixed or prefixed by some words like pura, nagla, tola, toli etc. These hamlets form generally small clusters of homesteads in the village territory situated at a distance of the main settlement site mostly traditionally occupied by mixed or depressed castes or untouchables, who live in relative social isolation and are hired for field operations by well-to-do high caste farmers[1]. There are various examples of hamlets inhabited by higher castes also, in which different groups live more independently[2]. These units may be considered as settlement cells or sub-villages. Sometimes the village may not have any settlement and may be grouped as 'uninhabited' in the census, locally called as *nachiragi* ar *bechiragi* (village without light). There are 900 inhabited villages and 90 uninhabited villages in the study area.

2.0 GENERAL DISTRIBUTION AND SITING OF RURAL SETTLEMENTS

The study area forms parts of the Ganga Yamuna Doab, which is a vast area of alluvial plain. The area has almost uniform distribution of rural settlements (Fig. 3.1). This uniformity is locally disturbed by various physico-cultural and environmental factors such as relief, sources of water supply, drainage and social conditions, land use, land tenure, crop

1. Mukherjee, R.K., *Man and His Habitation*, Bombay: Popular Pub. 1968, p. 67.
2. Singh, K.N. and Rana P.B. Singh, 'Some Methodological Components in Rural Settlement Research' in *Readings in Rural Settlement Geography* ed. R.L. Singh, K.N. Singh, Rana P.B. Singh, Varanasi, National Geographical Society (1975), pp. 26-40.

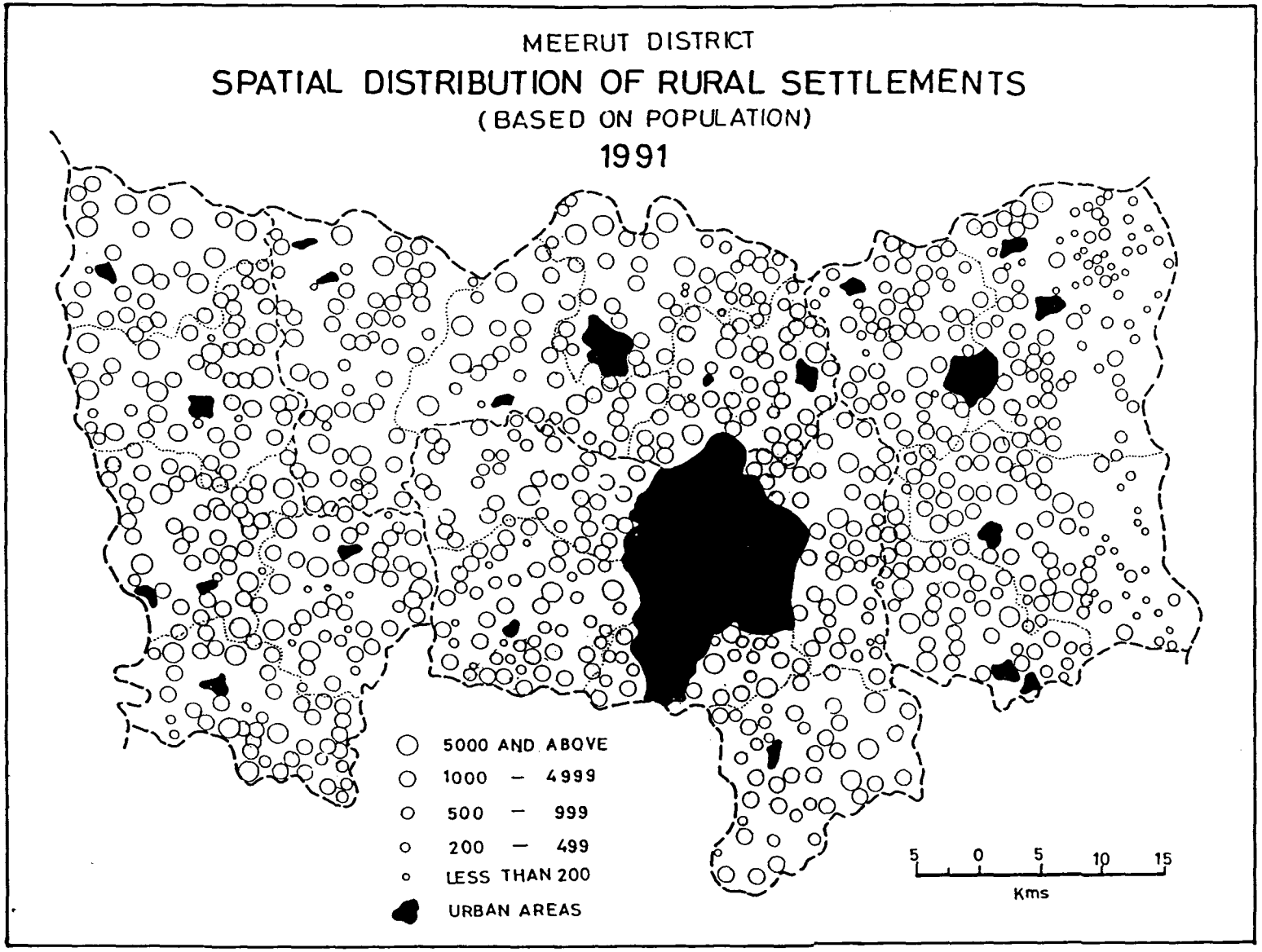
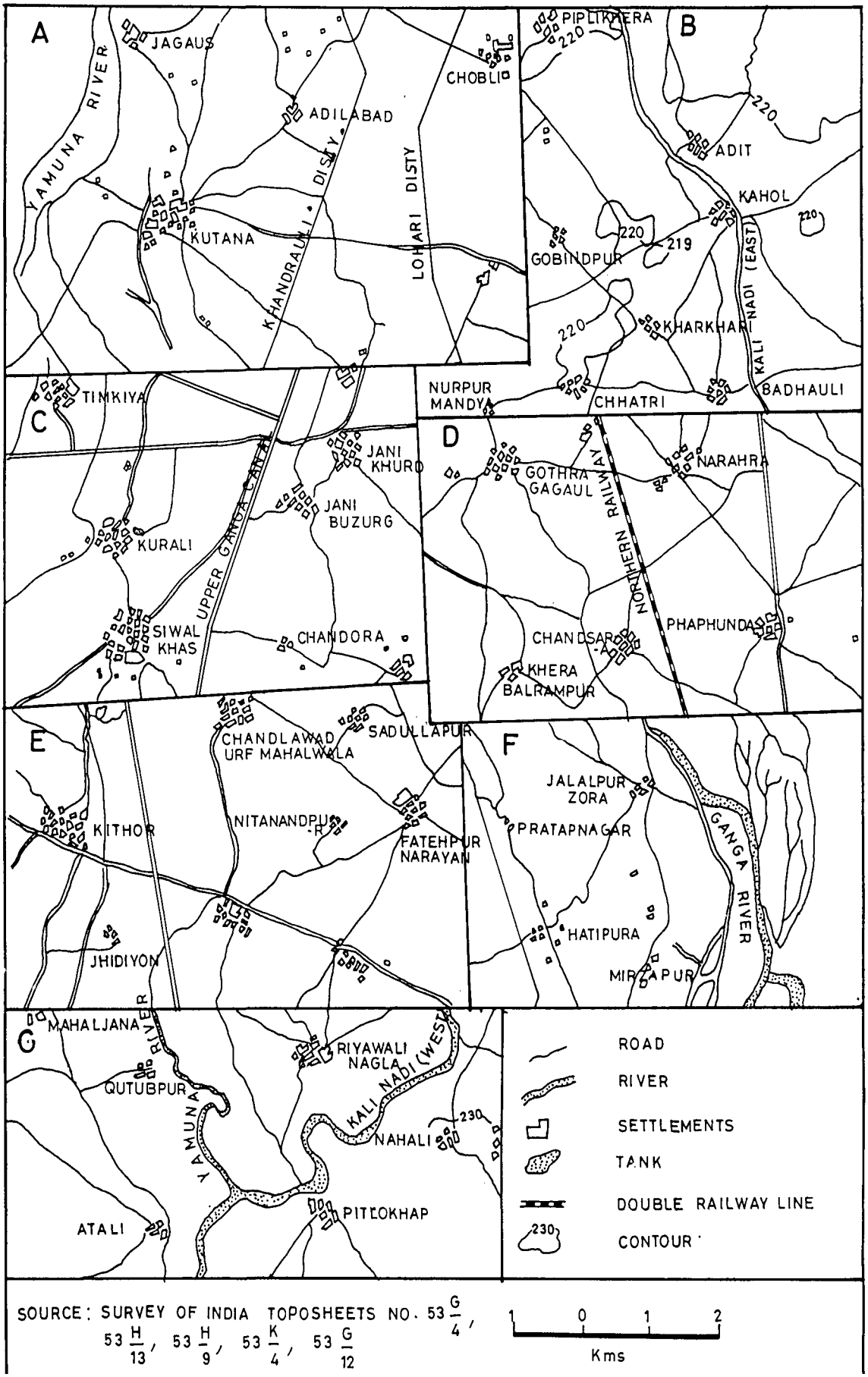

MEERUT DISTRICT
SPATIAL DISTRIBUTION OF RURAL SETTLEMENTS
(BASED ON POPULATION)
1991
5000 AND ABOVE
1000 – 4999
500 – 999
200 – 499
LESS THAN 200
URBAN AREAS
5 0 5 10 15
Kms

FIG. 3·1

combination, means of transport and communication, population distribution etc. In the District, Alamgirpur has proved to be the oldest site of human habitation. It dates back to around 1800 B.C. as revealed by recent archeological excavations. It is situated on the left bank of river Hindan. In the early period, settlements developed mostly by the side of water bodies such as rivers and tanks. The glorious city of Hastinapur was also situated on the right bank of river Ganga, but it was inundated by flood in past. Recently developed markets, roads and tracks seem to have had little influence on the general distributional aspects of rural settlements as almost the entire settlement pattern evolved due to physical conditions of the area. As a response to modern development of communication and transport, some villages and hamlets have added functions as a small market centre along the roads and near railway stations, e.g., Daurala, Mataur, Sakoti, Dadri etc. (Fig. 3.2).

Two rivers the Ganga in the east and the Yamuna in the west bound the District. Both the streams have influenced the selection of sites for human habitation in the study area. The low-lying areas are inundated during the rainy season. So large tracts of lands are very sparsely inhabited, and the sizes of their villages. Fig. 3.2, A, B, F, G clearly show the arrangement of houses along a street running almost parallel to the river course in such villages. Protective embankments erected along the Ganga have provided facilities for settling along the river, thus forming

MEERUT DISTRICT
RURAL SETTLEMENT DISTRIBUTION ACCORDING TO SITE



compact villages like Kishorpur, Bastora Norang etc. (Fig. 3.2 F). Similarly along the Kali Nadi are found a number of semi compact villages showing a linear pattern (Fig. 3.2 B, G). The central low-lying area of the District, which becomes sometimes water logged during rainy season, also contain semi compact villages.

Tank site settlements are the important features in Mawana and Meerut tehsils. The tanks and lakes in the region with various patches of infertile usar lands mainly in Parikshitgarh block have made their impact on the distributional pattern of settlements in such areas (Fig. 3.2 C).

The western part of the region exhibits even distribution of settlements and has large and medium sized compact villages because of high water table, fertile and well irrigated lands in these areas while in Ganga Khadar most of the settlements are small and hamleted owing to the presence of light and poor soil and recurrence of flood.

3.0 SIZE OF RURAL SETTLEMENTS

Size (area and population) and density of rural settlements are closely related with spacing. As the distance between settlements increase, the density of villages will decrease. In the study area the average areal size of villages is 4.15 km^2, Table 3.1 shows the highest per village areal coverage (6.741 km^2) in Chhapraulí block of Baghpat tehsil while the lowest

Table 3.1
Distribution of Area Average Per Village Square Km. (1991)

S.No.	Blocks	Area in Sq.Km.	No. of Settlements	Average Per Village Sq. Km.
1	Chhaprauli	182.0	27	6.741
2	Baraut	235.8	54	4.367
3	Baghpat	187.0	51	3.667
4	Pilana	203.6	50	4.072
5	Khekra	162.7	46	3.537
6	Binauli	297.9	59	5.049
7	Saroorpur Khurd	204.4	34	6.012
8	Sardhana	186.3	47	3.964
9	Daurala	189.2	51	3.709
10	Mawana Kalan	221.6	57	3.888
11	Hastinapur	349.4	86	4.063
12	Parikshitgarh	318.7	72	4.426
13	Machra	185.6	48	3.867
14	Rasulpur Rohta	154.5	45	3.433
15	Jani Khurd	175.6	56	3.136
16	Meerut	72.1	25	2.884
17	Rajpura	163.9	49	3.345
18	Kharkhauda	197.4	43	4.591
		3687.8	900	4.153

Source: Compiled from District Census Handbook (1991), Meerut.

areal size (2.884 km²) is found in Meerut block of Meerut tehsil. Fig. 3.3 shows areal size of a village in the District per Km² at the block level. The villages located in the Yamuna Khadar and along the tract between the river Hindan and the Ganga Canal, especially in Chhaprauli block of Baghpat tehsil and Saroorpur Khurd and Binauli blocks of Sardhana tehsil.

The average population of a village in the study area is 2534.52 persons. Fig. 3.4 shows the average population of a village at block level. Table 3.2 reveals that only 9.67 per cent of the villages of the District have populations of above 5000 persons. Table 3.3 shows the average population per village in the different blocks of the Meerut District. The highest per village population is found in Chhaprauli block, i.e., (4404 persons) followed by Saroorpur Khurd (3519 persons) and Baraut (3406 persons) blocks. The lowest per village population is found in Hastinapur block (1099 persons) followed by Parikshitgarh block (1860 persons).

The classification of villages of the District based on size of population has also been taken into consideration while studying the spatial distribution of rural settlements in the region. The villages of the District have been categorized into six population groups ranging from less than 200 to more than 5000 persons. Table 3.4 shows the distribution of the population of villages in the District. There are 50 total villages, i.e., 5.56 per cent of the villages in the District inhabited by less than 200 people,

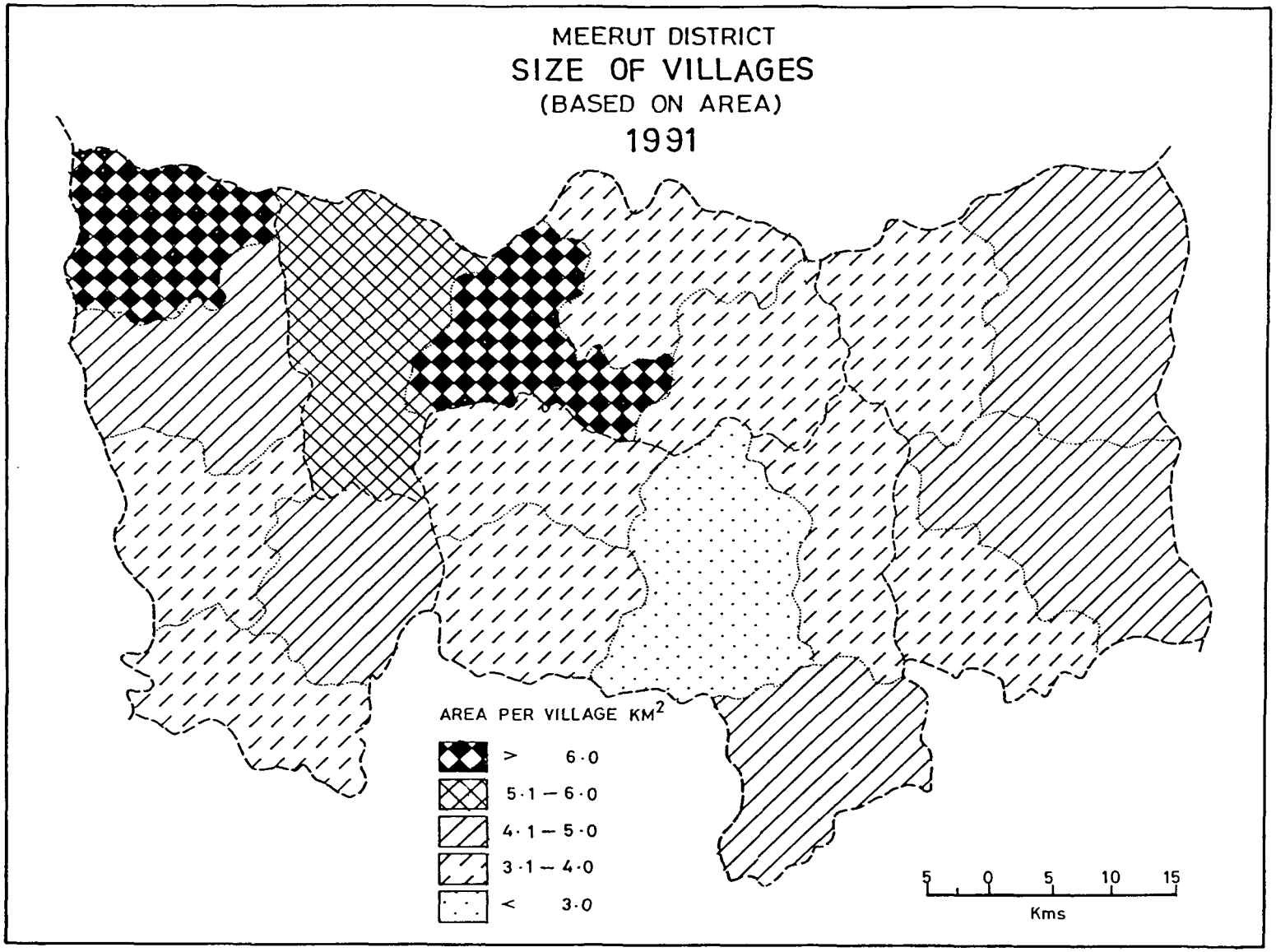

MEERUT DISTRICT
SIZE OF VILLAGES
(BASED ON AREA)
1991
AREA PER VILLAGE KM²
> 6·0
5·1 — 6·0
4·1 — 5·0
3·1 — 4·0
< 3·0
5 0 5 10 15
Kms

FIG. 3·3

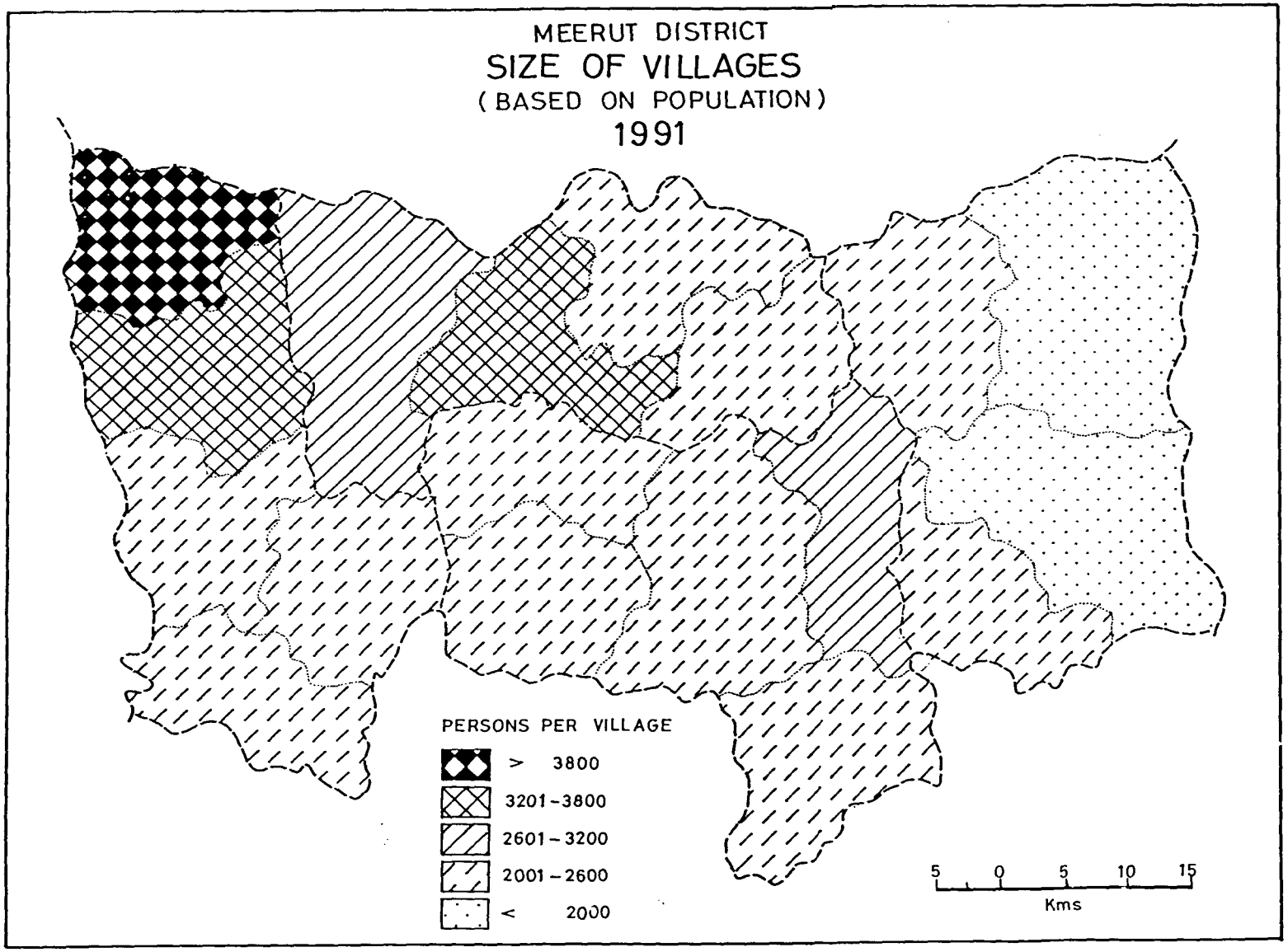

MEERUT DISTRICT
SIZE OF VILLAGES
(BASED ON POPULATION)
1991
PERSONS PER VILLAGE
> 3800
3201-3800
2601-3200
2001-2600
< 2000
5 0 5 10 15
Kms

FIG. 3.4

Table 3.2
Classification of Villages by Population Ranges (1991)

Range of Population	Number of villages in each range	Percentage of villages in each range
Below 200	50	5.56
200-499	53	5.89
500-1999	361	40.11
2000-4999	349	38.77
5000-9999	87	9.67
10,000 and above	--	--
Total	**900**	**100.00**

Source: Compiled from District Census Handbook Meerut, (1991).

Table 3.3
Distribution of Population (Average Village Size) at Block Level

S.No.	Blocks	Population	No. of Settlements	Average Per village Population
1	Chhaprauli	118932	27	4404.89
2	Baraut	183945	54	3406.39
3	Baghpat	128393	51	2517.51
4	Pilana	128606	50	2572.12
5	Khekra	112969	46	2455.85
6	Binauli	169473	59	2872.42
7	Saroorpur Khurd	119667	34	3519.62
8	Sardhana	111116	47	2364.17
9	Daurala	115481	51	2264.33
10	Mawana Kalan	120274	57	2110.07
11	Hastinapur	94567	86	1099.62
12	Parikshitgarh	133961	72	1860.57
13	Machra	109784	48	2287.17
14	Rasulpur Rohta	100759	45	2239.08
15	Jani Khurd	123334	56	2202.39
16	Meerut	51277	25	2051.08
17	Rajpura	137793	49	2812.10
18	Kharkhauda	111024	43	2581.95
		2171355	900	

Source: Compiled from District Census Handbook (1991) Meerut.

Table 3.4
Classification of villages according to size of population 1991

S. No.	Block	Total No. of villages	% of the district	Very small villages, below 200 persons			Small villages 200-499 persons			Medium villages 500-999 persons			Large villages 1000-1999 persons			Very large villages 2000-4999 persons			Over growth villages Above 5000 persons		
				A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
1	Chhaprauli	27	3.0	1	2	3.703	--	--	--	--	--	--	5	2.06	18.52	13	3.72	48.15	8	9.19	29.63
2	Baraut	54	6.0	2	4	3.703	2	3.773	3.703	7			10	4.13	18.52	21	6.02	38.89	12	13.79	22.22
3	Baghpat	51	5.67	2	4	3.92	2	3.773	3.921	3			20	8.26	39.21	19	5.44	37.25	5	5.75	9.80
4	Pilana	50	5.55	5	10	10	3	5.660	6.0	7	5.88	14.0	9	5.88	12.96	19	5.44	38.0	7	8.04	14.0
5	Khekra	46	5.11	--	--	--	3	5.660	6.521	7	5.88	15.22	16	2.52	5.88	15	4.29	32.61	5	5.75	8.93
6	Binauli	59	6.55	1	2	1.694	1	1.886	1.694	9	7.56	15.25	19	7.85	32.20	21	6.02	35.59	8	9.19	13.56
7	Saroorpur Khurd	34	3.78	1	2	2.941	--	--	--	4	3.36	11.76	6	2.48	17.65	14	4.01	41.17	9	10.34	26.47
8	Sardhana	47	5.22	2	4	4.255	1	1.886	2.127	9	7.56	19.15	13	5.37	27.66	17	4.87	36.17	5	5.75	10.64
9	Daurala	51	5.67	1	2	1.960	--	--	--	8	6.72	15.68	14	5.78	27.45	25	7.16	49.02	3	3.45	5.88
10	Mawana Kalan	57	6.33	2	4	3.508	4	7.547	7.017	5	4.20	8.77	18	7.44	31.58	26	7.45	45.61	2	2.29	3.51
11	Hastinapur	86	9.55	14	28	16.279	20	37.735	23.25	18	15.12	20.93	19	7.85	22.09	14	4.01	16.28	1	1.15	1.16
12	Parikshitgarh	72	8.0	11	22	15.277	6	11.320	8.33	7	5.88	9.72	20	8.26	27.78	23	6.59	31.94	5	5.75	6.94
13	Machra	48	5.33	1	2	2.083	1	1.886	2.083	5	4.20	10.42	20	8.26	41.67	17	4.87	35.42	4	4.59	8.33
14	Rasulpur Rohta	45	5.0	--	--	--	3	5.660	6.666	6	5.04	13.33	13	5.37	28.89	22	6.30	48.89	1	1.15	2.22
15	Jani Khurd	56	6.22	5	10	8.928	1	1.886	1.785	11	9.24	19.64	13	5.37	23.21	22	6.30	39.28	4	4.59	7.14
16	Meerut	25	2.78	--	--	--	2	3.773	8.0	6	5.04	24.0	7	2.89	28.0	8	2.29	32.0	2	2.29	8.0
17	Rajpura	49	5.44	1	2	2.040	1	1.886	2.040	2	1.68	4.08	13	5.37	26.53	29	8.31	59.18	3	3.45	6.12
18	Kharkhauda	43	4.78	1	2	2.325	3	5.660	6.976	5	4.20	11.63	7	2.89	16.28	24	6.88	55.81	3	3.45	6.97
		900		50			53			119			242			349			87		

Source: Compiled from Primary Census Handbook and village and town directory of Meerut District, 1991.
A = No. of Villages B = % of the District C = % of the Block

whereas 53 villages comprising 5.89 per cent contain between 200 and 499 persons. The medium size of villages (500-999) account for 13.22 per cent, i.e., 119 villages, while large size villages (1000-1999) share 26.89 per cent, i.e., 242 villages. Very large villages with populations ranging between 2000 and 4999 are maximum in number and constitute 38.77 per cent. The exceptionally large size villages, inhabited by more than 5000 persons represent 9.67 per cent of the total number of villages in the District.

Very small villages (below 200 persons) are found in Hastinapur block, (14 villages), and Parikshitgarh (11 villages) in abundance while villages (above 5000 persons) are mostly found in Baraut (12 villages). Saroorpoor Khurd (9 villages), Chhaprauli (8 villages) and Binauli (8 villages) blocks.

Fig. 3.5 exhibits the distribution of population size of the villages at block level. It clearly reveals that there is an uneven distribution of the population of villages different categories and different blocks of the District. The proportion of villages of very small size varies from 1.694 per cent in Binauli to 16.27 per cent in Hastinapur whereas the District average is 5.55 per cent. Similar variation between different categories is also seen between the different blocks of the District.

4.0 DENSITY DISTRIBUTION OF SETTLEMENT

Agriculture being the main occupation of the people has resulted in a large number of settlements spread widely over the District. Since the level land is in general preferred for the location of the settlements, the

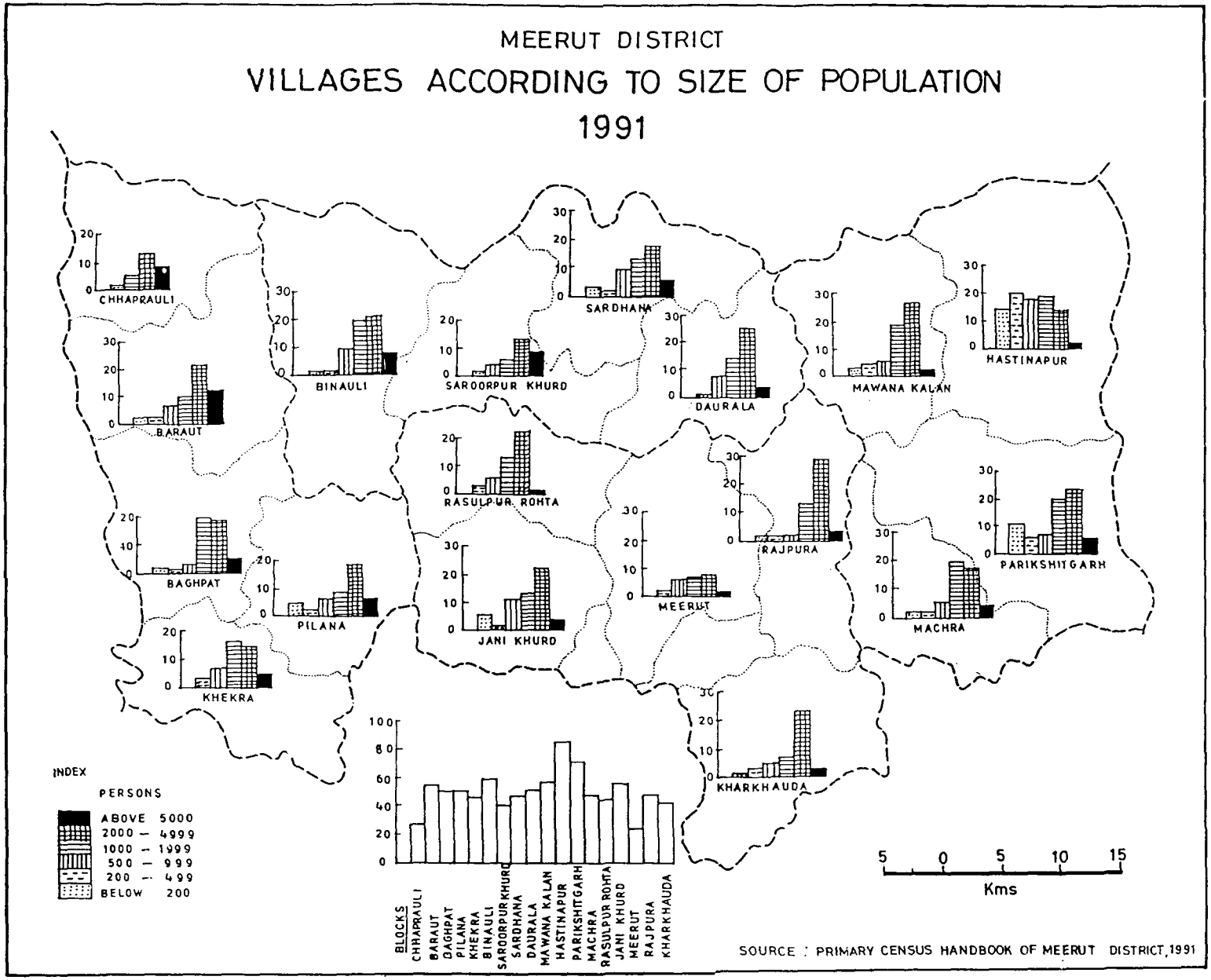

MEERUT DISTRICT
VILLAGES ACCORDING TO SIZE OF POPULATION
1991
CHHAPRAULI
BARAUT
BINAULI
SAROORPUR KHURD
SARDHANA
DAURALA
MAWANA KALAN
HASTINAPUR
RASULPUR ROHTA
BAGHPAT
PILANA
JANI KHURD
MEERUT
RAJPURA
PARIKSHITGARH
KHEKRA
MACHRA
KHARKHAUDA
INDEX
PERSONS
ABOVE 5000
2000 – 4999
1000 – 1999
500 – 999
200 – 499
BELOW 200
BLOCKS
CHHAPRAULI
BARAUT
BAGHPAT
PILANA
KHEKRA
BINAULI
SAROORPUR KHURD
SARDHANA
DAURALA
MAWANA KALAN
HASTINAPUR
PARIKSHITGARH
MACHRA
RASULPUR ROHTA
JANI KHURD
MEERUT
RAJPURA
KHARKHAUDA
5 0 5 10 15
Kms
SOURCE : PRIMARY CENSUS HANDBOOK OF MEERUT DISTRICT, 1991

FIG. 3.5

distributional pattern of settlements bears a direct correlation with the intensity of fertile plain and better communication facilities. The Table 3.5 shows that very low density (<15 settlements per 100 Km^2) is found in only one block, i.e., Chhaprauli block (14.84 settlements per 100 Km^2). The highest value is found in Meerut block (34.67 villages per 100 Km^2) followed by Jani Khurd (31.89 villages per 100 Km^2). The village density in the District varies from 14 to 34 villages per 100 Km^2 (Fig. 3.6).

5.0 SPATIAL ANALYSIS

Spacing is one of the most apparent attributes of rural settlements. It is defined as the locational arrangement of villages with respect to one another. To analyze this dimension the classical geographers have considered the spacing as a basis for the classification of rural settlements in different types. In Sweden, Switzerland France and Poland, the geographers have used fixed spacing as a unit for the measurement of concentration and dispersion[1]. Barnes and Robinson[2] first undertook the calculation of spacing of settlements. The formula used here to calculate

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1. Stone, K.H., "Multiple Scale Classification for Rural Settlement Geography", *Acta Geographica* (Helsinki), Vol. 20, No. 22, 1968, pp. 307-17, reprinted in *Readings in Rural Settlement Geography*, ed., R.L. Singh, K.N. Singh and Rana, P.B. Singh, Varanasi, N.G.S.T., I, Res. Pub. No. 11, 1975.
2. Robinson, A.H. and J.A. Barnes, "A New Method for the representation of Dispersed Rural Population", *Geographical Review*, Vol. 30, 1940, pp. 134-137.

Table 3.5
Spacing and nature of dispersion of Rural settlements in Meerut District

S. No.	Blocks	Area in Sq. Km.	No. of Settlements	A/N	d/km^2	D $=1.0746\sqrt{\frac{A}{N}}$	r_O	$r_E=\frac{1}{2}(d)^{1/2}$	$R_N=r_o/r_E$	$V=\frac{4-n}{(4dn)}=\frac{0.0683086}{d}$	$\delta r_E=\frac{0.26136}{\sqrt{(nd)}}$	C $=\frac{r_O-r_E}{\delta r_E}$	Di= $\frac{ro}{1.0750/\sqrt{d}}$
1	Chhaprauli	182.0	27	6.741	0.148	2.790	1.463	1.300	1.125	0.462	0.131	1.244	0.524
2	Baraut	235.8	54	4.367	0.229	2.246	0.967	1.045	0.925	0.298	0.074	1.054	0.429
3	Baghpat	187.0	51	3.667	0.273	2.058	0.880	0.957	0.919	0.250	0.070	1.1	0.427
4	Pilana	203.6	50	4.072	0.246	2.168	1.003	1.008	0.995	0.278	0.075	0.067	0.463
5	Khekra	162.7	46	3.537	0.283	2.021	0.985	0.939	1.049	0.241	0.072	0.639	0.487
6	Binauli	297.9	59	5.049	0.198	2.415	1.098	1.128	0.973	0.345	0.076	0.395	0.454
7	Saroorpur Khurd	204.4	34	6.012	0.166	2.635	1.221	1.227	0.995	0.411	0.11	0.055	0.462
8	Sardhana	186.3	47	3.964	0.252	2.139	1.079	0.996	1.083	0.271	0.076	1.092	0.504
9	Daurala	189.2	51	3.709	0.269	2.069	1.026	0.964	1.064	0.254	0.071	0.873	0.494
10	Mawana Kalan	221.6	57	3.888	0.257	2.119	1.041	0.986	1.056	0.266	0.068	0.809	0.491
11	Hastinapur	349.4	86	4.063	0.246	2.166	0.809	1.008	0.803	0.278	0.057	3.491	0.373
12	Parikshitgarh	318.7	72	4.426	0.226	2.261	0.975	1.052	0.927	0.302	0.065	1.185	0.431
13	Machra	185.6	48	3.876	0.259	2.113	0.955	0.982	0.973	0.264	0.074	0.365	0.452
14	Rasulpur Rohta	154.5	45	3.433	0.291	1.991	0.896	0.927	0.966	0.235	0.072	0.431	0.449
15	Jani Khurd	175.6	56	3.136	0.319	1.903	0.980	0.886	1.106	0.214	0.062	1.516	0.515
16	Meerut	72.1	25	2.884	0.347	1.825	0.18	0.849	1.389	0.197	0.089	3.719	0.646
17	Rajpura	163.9	49	3.345	0.299	1.965	0.973	0.914	1.065	0.228	0.068	0.868	0.495
18	Kharkhauda	197.4	43	4.591	0.218	2.303	1.3	1.071	1.214	0.313	0.085	2.694	0.565
		3687.8	**900**			**2.175**							

the spacing of settlements has been taken from Mather who studied the linear pattern of farm population in USA[1] i.e.,

$$D = 1.0746\sqrt{A/N}$$

Where D = theoretical distance between points or settlements in hexagonal arrangement.

A = area and

N = number of settlements per unit area.

On the basis of above equation the computation of the inter village distance for eighteen development blocks of the District have been done. The average inter-village distance for the District is 2.175 Km (Fig.3.7). Six blocks show spacing more than the District average, i.e., Chhaprauli (2.790 Km) Saroorpur Khurd (2.635 Km), Binauli (2.415 Km), Kharkahuda (2.303 Km), Parikshitgarh (2.261 km) and Baraut (2.246 Km) while the rest of the blocks show lesser than the average spacing. Table 3.5 shows the inter-settlement spacing at block level. Inter-village spacing may be grouped into five categories, which has been discussed into sequent manner.

5.1 Very Low Spacing (< 1.900 Km)

This category is found only in Meerut block. The value of its spacing is 1.825 Km. It covers 1.9 per cent of the total area (3687.8 Km^2) in the

1. Mather, E.C., "A Linear distance map of Farm Population in the U.S.", *Annals Association of American Geographer*, Vol. 34, 1944, pp. 173-180; also, Singh, Rana P.B. "Pattern Analysis of Rural Settlement Distribution and their types in Saran Plain: A Quantitative Approach" *National Geographical Journal of India*, Vol. 20, 1974, pp. 109-127.

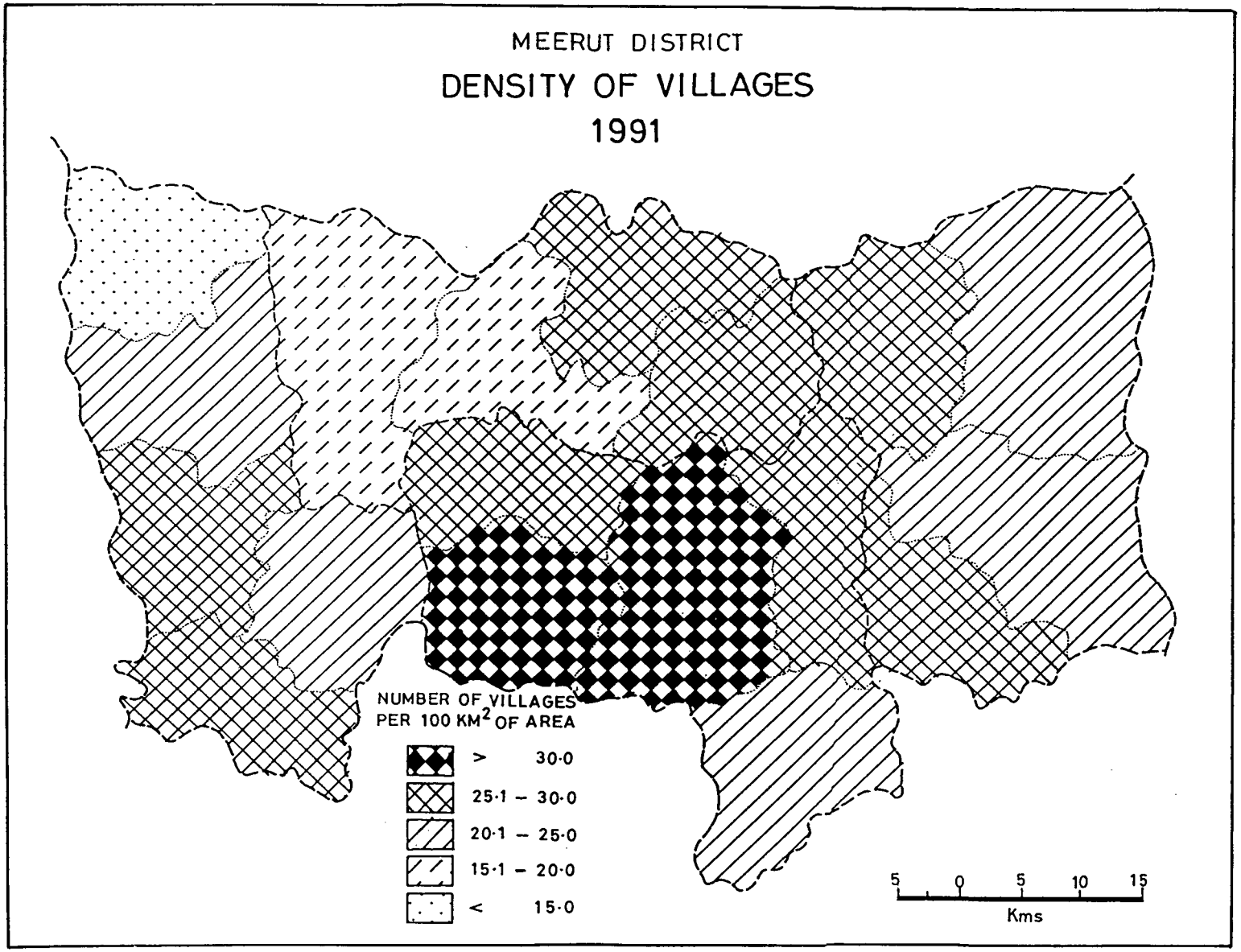
MEERUT DISTRICT
DENSITY OF VILLAGES
1991
NUMBER OF VILLAGES
PER 100 KM² OF AREA
> 30·0
25·1 – 30·0
20·1 – 25·0
15·1 – 20·0
< 15·0
5 0 5 10 15
Kms

FIG.3.6

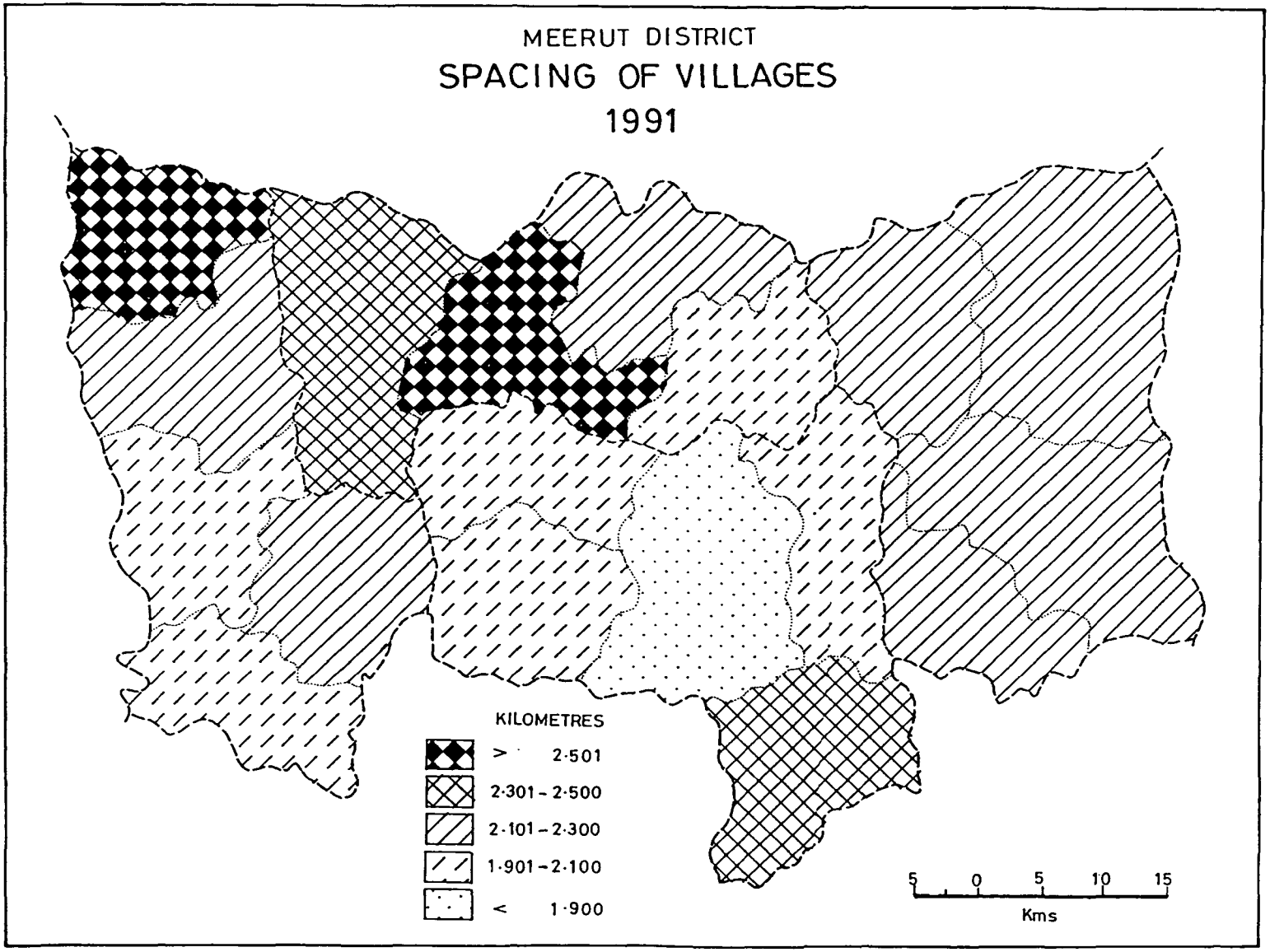
MEERUT DISTRICT
SPACING OF VILLAGES
1991
KILOMETRES
> 2·501
2·301 - 2·500
2·101 - 2·300
1·901 - 2·100
< 1·900
5 0 5 10 15
Kms

FIG. 3.7

southern part of the District. It has 2.4 per cent (51277 persons) of the total rural population and 2.8 per cent (25 villages) of the total number of villages of the District. The average village density of this block is (34 villages / 100 Km^2). The soil of the block is of excellent quality and the land is highly productive. Since fertile land is found all over the area, small settlements have sprung up in large numbers and the spacing between them is very thin. This is the result of the availability of fertile land, high water table, accessibility to means of transport and communication and presence of cultivators of diverse castes.

5.2 Low Spacing (1.901 – 2.100 Km)

This group is found in Baghpat (2.058), Khekra (2.021), Daurala (2.069), Rasulpur Rohta (1.991), Jani Khurd (1.903) and Rajpura (1.965) blocks. This group covers an area of 1032.9 Km^2 or 28 per cent of the total area of the District. The lowest spacing is found in Jani Khurd block (1.0903), while the highest in the Daurala block (2.069). It contains 33.1 per cent (718729 persons) of the District's rural population and 33.1 per cent (298 villages). Here average area per village ranges from 3.14 Km^2 (Jani Khurd) to 3.71 Km^2 (Daurala), while village density shows variations between 26 (Daurala) to 31 (Jani Khurd) per 100 Km^2 of area. The agricultural land is fertile as well as development of transport, communication, and irrigational facilities like canal and tube-well are responsible for the growth of semi-compact settlements in these areas.

5.3 Moderate Spacing (2.101 – 2.300 Km)

This group accounts seven blocks of the District, Baraut and Pilana in tehsil Baghpat, Sardhana block and whole of Mawana tehsil, i.e., Mawana Kalan, Hastinapur, Parikshitgarh and Machra blocks. The value of spacing in these blocks ranges from 2.113 Km (Machra) to 2.261 Km (Parikshitgarh) and covers 46 per cent (1701.0 Km^2) of the District's area. It has 46 per cent (414) of the total inhabited villages and 40.63 per cent (882,253 persons) of the total rural population of the District. The size of settlement here is slightly bigger where land is cultivable but in Ganga Khadar the settlements are small due to recurrence of flood.

5.4 High Spacing (2.301 – 2.500 Km)

Relatively high spacing is found in two blocks of the District, viz., Banauli (2.415 Km) and Kharkhauda (2.303 Km). This group comprises 13.4 per cent (495.3 Km) of the total area of the District. The areal size of villages in these blocks is 5.04 Km^2 (Binauli) and 4.59 Km^2 (Kharkhauda). They together constitute 12.9 per cent (280497) of the total rural population of the District and 11.3 per cent (102) of its inhabited villages. The number of villages per 100 Km^2 of rural area in these blocks is 19 (Binauli) and 21 (Kharkhauda). The Binauli block is situated in the Yamuna Hindan Doab and on the whole this tract is the fertile portion of the District but is flanked by belts of poor soil and broken relief associated with the two rivers. The

soil is of poor quality, the terrain being generally broken up by small ravines. Lack of cultivable land, irrigational facilities and inadequate means of transport are the main causes for high inter-village spacing in the study area.

5.5. Very High Spacing (above 2.501 Km)

Very high spacing is found in two blocks of the District, i.e., Chhaprauli (2.790 Km) and Saroorpur Khurd (2.635 Km) blocks and both them covers about 10.5 per cent (386.4 Km^2) of the total area of the District. These two blocks lie in Yamuna Hindan Doab and is flanked by belts of poor soil and broken relief associated with two rivers. The highest spacing occurs most strikingly along the rivers. Settlements of this nature are mostly concentrated at high or round level for protection from floods. There are a number of bhur mounds along the banks of the rivers. So most of these areas are rendered uninhabited. Besides, lack of irrigational facilities, transport and communication are also responsible for high inter-village spacing in these two blocks. They constitute 6.7 per cent (61 villages) of the total number of its inhabited villages and 10.98 per cent (238,599) of its total rural population. Since spacing in these blocks is very high, the areal coverage of settlements is also high. The average size per village is 6.741 Km^2 in Chhaprauli and 6.012 Km^2 in Saroorpur Khurd and

the number of settlements per 100 Km^2 is 14 in Chhaprauli and 16 in Saroorpur Khurd.

The foregoing discussion reveals a direct relationship between spacing and settlement size in different blocks of the District. It is concluded that were spacing is high villages are of larger sizes with a small number of hamlets having higher densities of population, which results in compact structure of settlements. On the contrary in areas of low spacing, settlements are generally smaller in size with low pressure of population and scattered distributional pattern, viz., hamleted type settlements.

The radial distribution function of rural settlements can be interpreted with the help of plotting theoretical spacing (D) on the one coordinate and village density per 100 Km^2 (d) on the other (Fig.3.8). The figure shows that as the spacing decreases, the village density will increase and vice versa. Low spacing < 1.900 Km with higher village density (34 villages per 100 Km^2) will be taken as the index of hamleted type, medium spacing (< 2.4 Km) with medium settlement density (21-29 villages per 100 Km^2) is an indicator of semi-compact structure while high spacing (> 2.4 Km) with low village density < 21 villages per 100 Km^2 may be taken as an index of compact structure. Since these indices are not sufficient for the classification of rural settlement, other indices may be considered and coordinated with them to classify the rural settlements as discussed below.

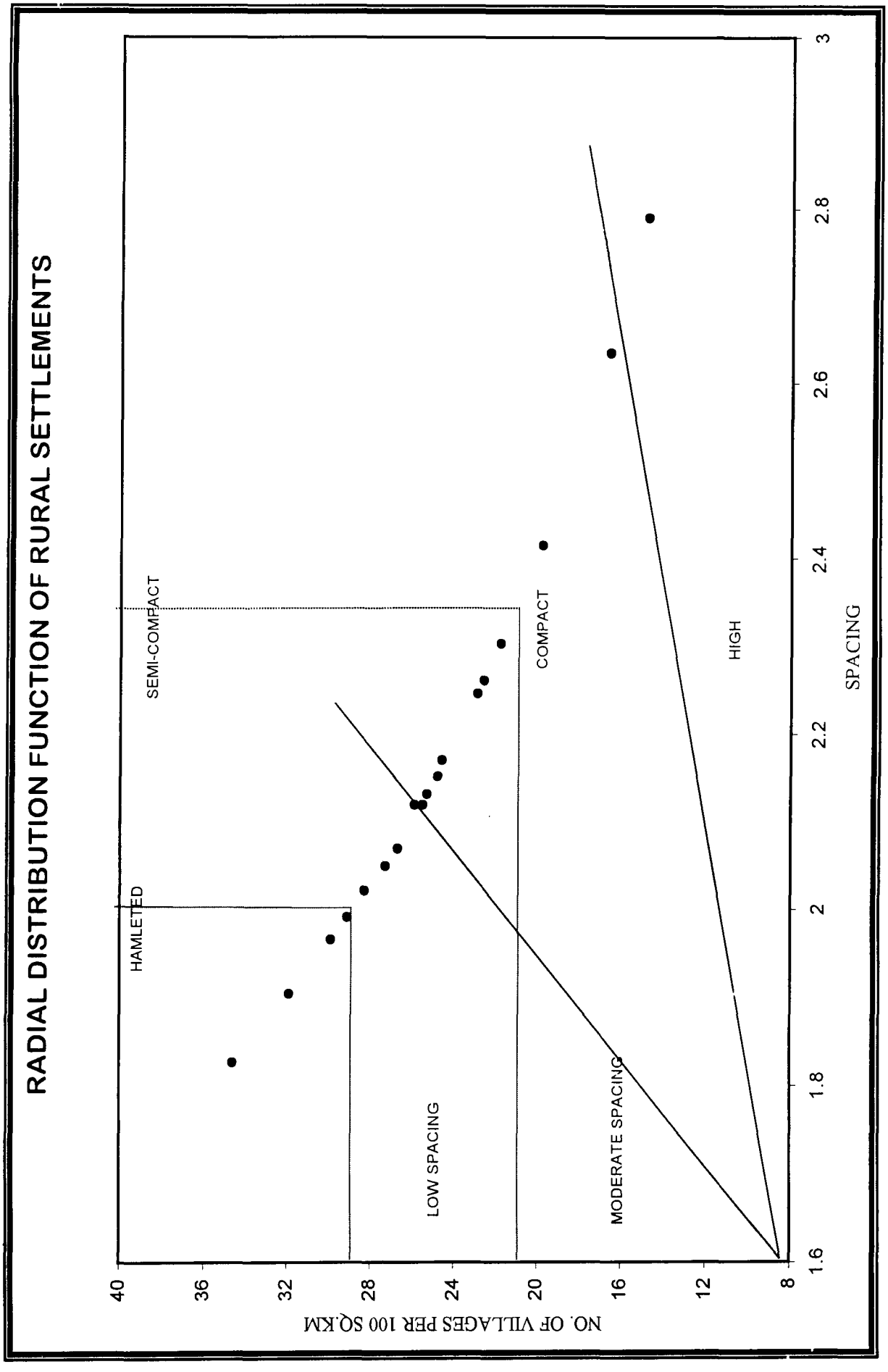
RADIAL DISTRIBUTION FUNCTION OF RURAL SETTLEMENTS
NO. OF VILLAGES PER 100 SQ.KM
SPACING
HAMLETED
SEMI-COMPACT
COMPACT
LOW SPACING
MODERATE SPACING
HIGH
40
36
32
28
24
20
16
12
8
1.6
1.8
2
2.2
2.4
2.6
2.8
3

Fig. 3.8

6.0 DISPERSION ANALYSIS

Though the agrarian set up, land tenure and human influences have played a major role in modification and transformation of habitat system, yet the forces determining the present rural settlement patterns have been mainly related to physical character of the terrain with their direct and indirect influence. Stone and Hudson have evolved several statistical techniques of measuring degree of dispersion and concentration. They have no precise connotations and their significance levels vary from region to region owing to the presence of physico-cultural diversity. An attempt has been made here to measure the degree of dispersion, taking basis of observed mean of nearest inter-village straight line distance, the method being termed as nearest neighbor distance approximation analysis. In this analysis it is assumed that points are distributed randomly in accordance with Poisson Probability Function, which assumes that each location has an equal chance of containing a point, while in the real world, settlements are neither always evenly spaced, nor are they spaced in strictly random pattern.[1] Thus, dispersion may be defined as the degree of deviation of set of points from random relative to some delimited area.[2] By definition, "complete randomness is the midpoint of the continuum of spatial patterns extending from complete clustering to complete uniformity"[3] The index of

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1. Dacey, M.F., "A County Seat Model for the Areal pattern of an Urban System" *Geographical Review*, Vol. 56, 1966, pp. 527-42.
2. Singh, R.P.B., "*Clan Settlement in the Saran Plain (Middle Ganga Valley): A study in cultural Geography*", N.G.S.I., Research Publication No. 18 (Varanasi, p. 57).
3. Dacey, M.F., *op cit.*, 527-542.

randomness (R_N) can be computed by using the formula developed by plant ecologists, Clark and Evans[1] as

$$R_N = \frac{r_o}{r_E}, \qquad \text{where,} \quad r_E = \frac{1}{2\sqrt{d}}$$
$$= 2r_o\sqrt{d}$$

In the present analysis Development Blocks have been taken as the standard areal unit for measurement of R_N value, and all the inhabited settlements in the different blocks of region have been taken into consideration for the present analysis.

The R_N value is used as a measure of the degree to which observed distribution approaches or deviates from random expectation. The value of the statistics ranges from 0.0 (complete concentration) through 1.0 (random) to 2.149 (ideal or normative hexagonal lattice). This index of R_N value can be correlated with variance V for further testing, which can be computed by the mathematical formula[2].

$$V = (4 - n) / 4dn = 0.0683086 / d$$

When the value of r_E is greater than V, the distribution is termed as regular; when the value of V is greater than the r_E, it is termed clustered and the term random is applied in case when V and r_E are equal, i.e., the

1. Clark,P.J.and F.C. Evans, "Distance to Nearest Neighbour as a measure of relationship in population", *Ecology*, Vol. 35, 1954, pp. 445-453.
2. Dacey, M.F. "Order Distance in a Homogenous Random Point Pattern", *Canadian Geographer*, Vol. 9, pp. 144-152.

variance mean ratio is one. In the present case, the value of r_E is always more than V, thus representing a regular rather than random pattern. The test of the significance of r_E is made out with the hypothesis of Poisson Probability on the basis of standard error (σr_E)[1], which is given as

$$\sigma r_E = 0.26136 / \sqrt{nd}$$

where, n denotes the total number of villages in an areal unit, while d = density of villages per sq km. The significance test of departure can be made through the statistic of standard variate of normal curve[2], the formula being:

$$C = \frac{(r_O - r_E)}{\sigma r_E}$$

Where C is the standard variate of the normal curve, and σr_E is the standard error of the mean distance to nearest neighbour in a randomly distributed population of the same density as that of the observed population.

The upper and lower ranges of random matching at 95 per cent probability level will be computed by using the following formula.[3]

$$\text{i.e., } = (2\sigma r_E \pm r_E) / r_E$$

---

1. Clark and Evans, *op.cit.*, p. 450.
2. King, L. J., '*Statistical Analysis' in Geography*, New Jersey, Prentice Hall, 1969, pp. 99-100.
3. *Ibid.* p. 103.

The width of the range of randomness depends upon the number of points (villages). The greater the number of points, the smaller the range and vice versa. Fig. 3.9 shows the range of random matching at 95 per cent probability level and reveals that the blocks of the District fall under all the three categories i.e., clustered, random and regular indicating a clear tendency towards regularity.

Table 3.5 shows the result of the R_N values and different calculated indices refer to the nearest neighbor analysis for each development block of the District while Fig.3.10 gives the measurement of the spatial patterns of rural settlements in the study area. The RN values ranging from 0.803 (Hastinapur block) to 1.389 (Meerut block) reveal a clear tendency towards regularity. On the basis of the results obtained five categories can be observed (Fig. 3.11).

6.1 Clustered Grouping (< 0.975)

The clustered grouping of rural settlements is observed in seven blocks of the District. They are Baraut, Baghpat, Binauli, Hastinapur, Parikshitgarh, Machra, Rasulpur Rohta, covering 46.88 per cent of the total area of the District (1728.9 sq Km) and 46.1 per cent (415) of the total number of inhabited villages and 42.41 per cent of its total rural population. This area has the clustered form of rural settlements, owing to the presence of rich local agricultural resources and fertile soils.

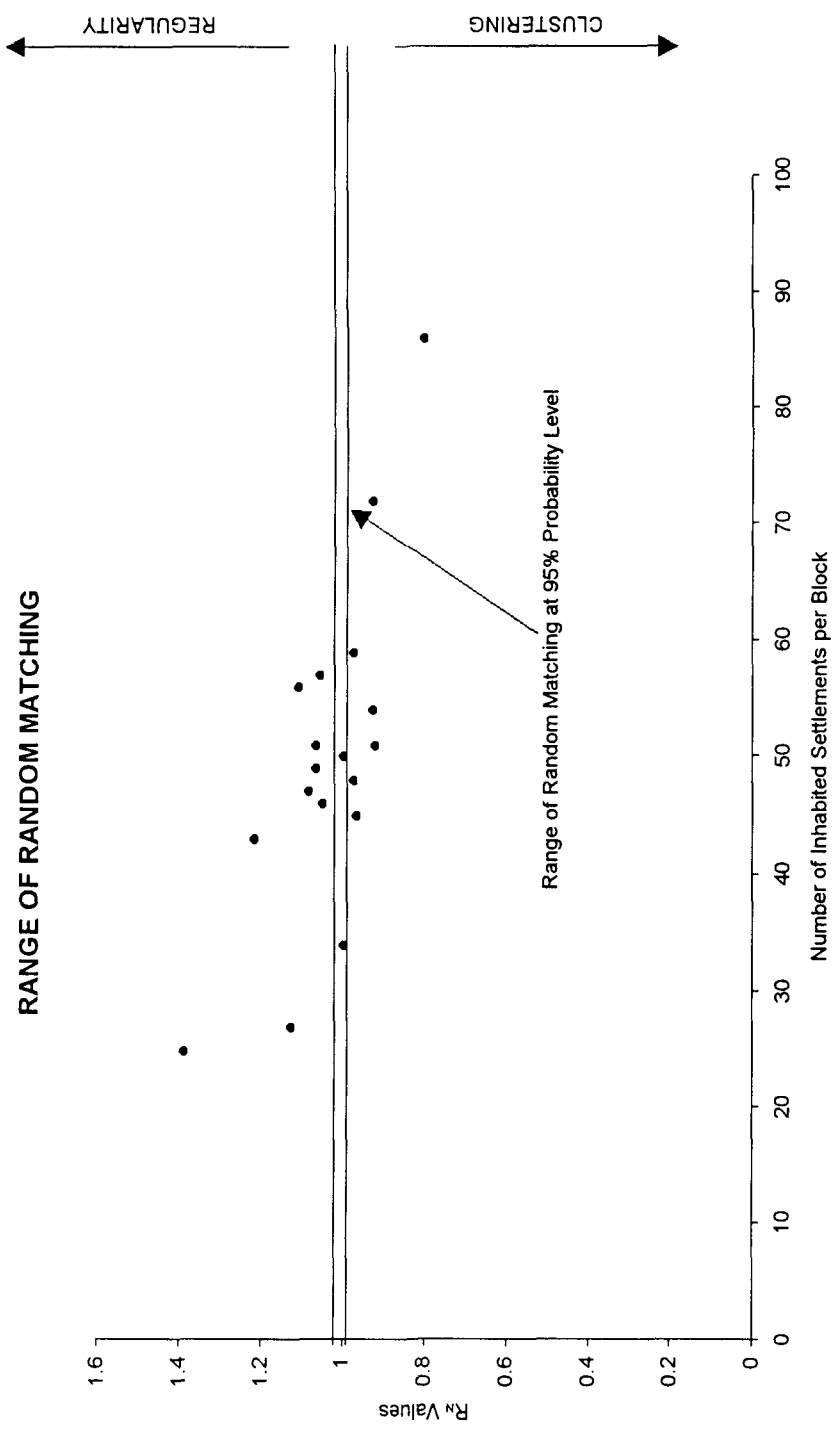
RANGE OF RANDOM MATCHING
REGULARITY
CLUSTERING
Range of Random Matching at 95% Probability Level
R_N Values
Number of Inhabited Settlements per Block
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
10
20
30
40
50
60
70
80
90
100

FIG. 3.9

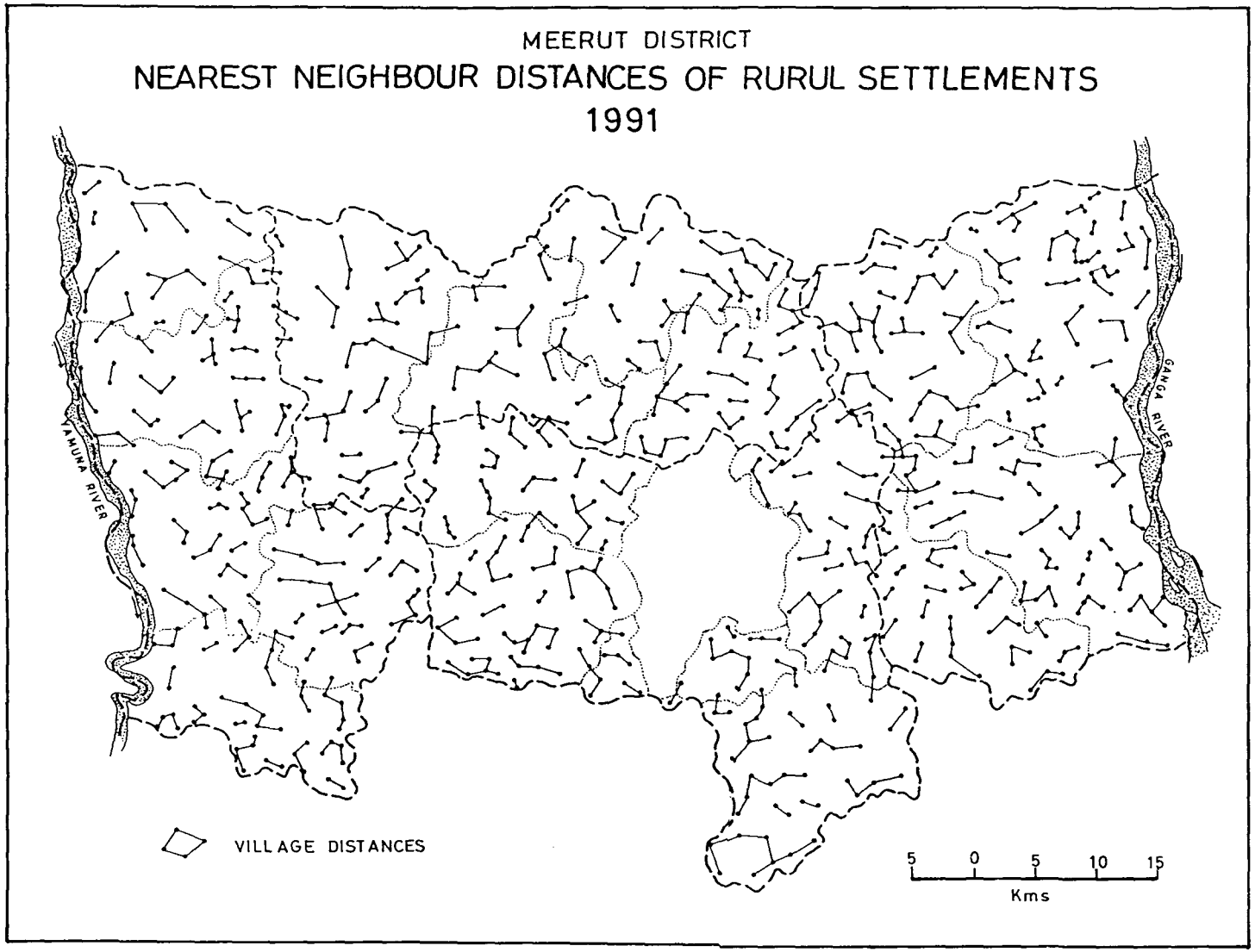
MEERUT DISTRICT
NEAREST NEIGHBOUR DISTANCES OF RURUL SETTLEMENTS
1991
YAMUNA RIVER
GANGA RIVER
VILLAGE DISTANCES
5 0 5 10 15
Kms

FIG. 3.10

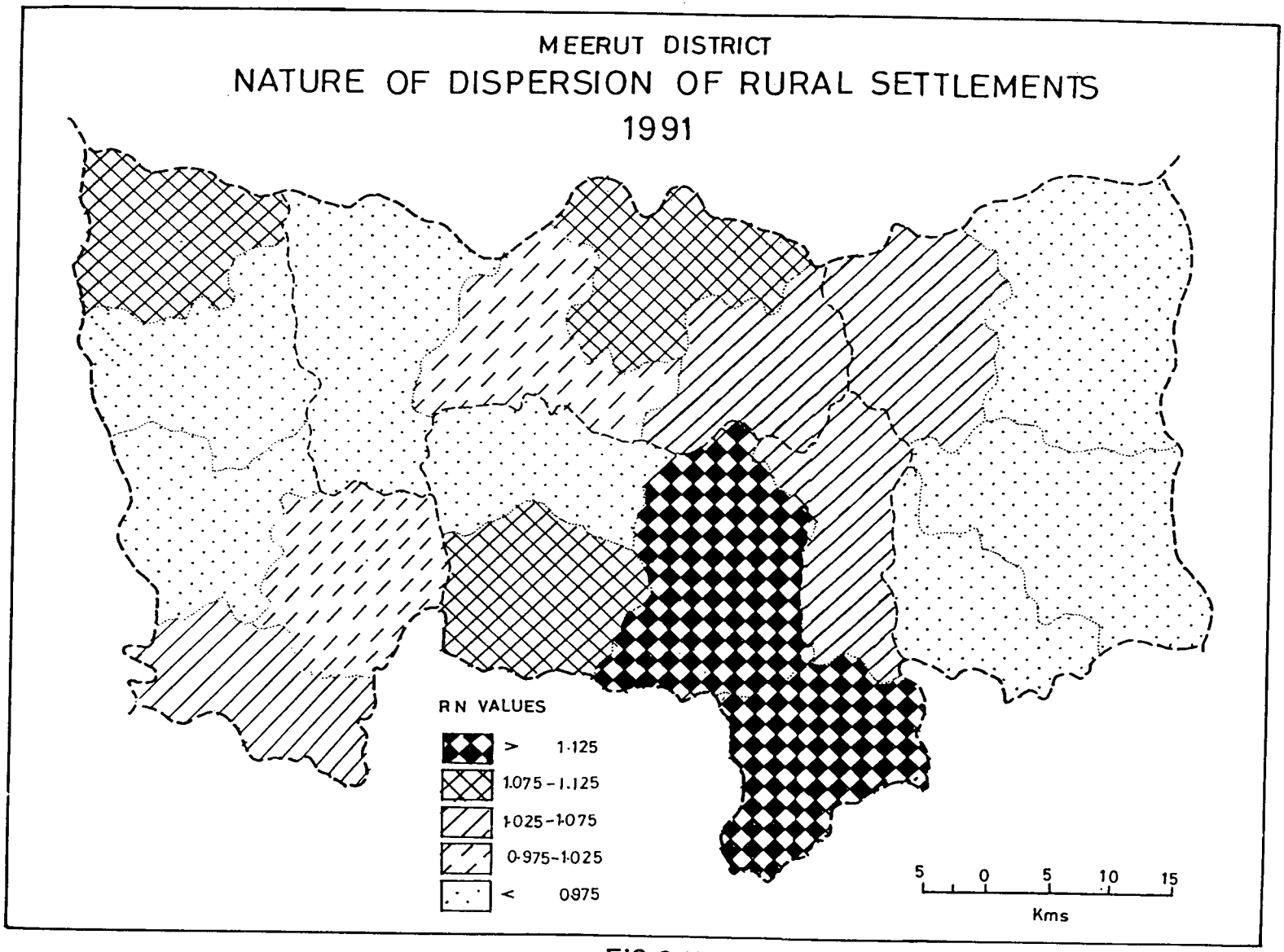
MEERUT DISTRICT
NATURE OF DISPERSION OF RURAL SETTLEMENTS
1991
RN VALUES
> 1·125
1·075 - 1·125
1·025 - 1·075
0·975 - 1·025
< 0·975
5 0 5 10 15
Kms

FIG. 3.11

6.2 Random Grouping (0.975 – 1.025)

The random distribution of rural settlements occupies nearly 11.06 per cent area (408 sq Km.) and 9.33 per cent (84) of the total rural settlements and 11.43 per cent of its total rural population of the District. It covers two blocks, i.e., Pilana and Saroorpur Khurd. The observed inter village distance of Pilana and Saroorpur blocks are 1.003 Km and 1.221 Km while the expected distance is 1.008 Km and 1.227 Km respectively.

6.3 Low Regularity (1.025 – 1.075)

Areas of low regularity comprises of four blocks, namely Khekra, Mawana Kalan, Daurala and Rajpura, covering 19.99 per cent (737.4 sq km.), 22.56 per cent (203) of the total number of inhabited villages and 22.41 per cent of its total rural population. The area is characterized by varying nature of villages ranging from small to large size, i.e., 162.7 sq Km. (Khekra) to 221.6 sq Km. (Mawana Kalan). The observed inter village distance ranges from 0.973 (Rajpura) to 1.041 Km (Mawana Kalan) while the expected distance varying from 0.914 Km (Rajpura) to 0.986 Km (Mawana Kalan).

6.4 Moderate Regularity (1.075 – 1.125)

It occupies three blocks of the District namely Sardhana (1.083), Jani Khurd (1.106) and Chhaprauli (1.125), which accounts 14.75 per cent

(543.9 sq Km.) area of the District, 14.44 per cent (130) of the total number of inhabited villages and 16.27 per cent of its total rural population. The village density per 100 sq Km varying from 14 (Chhaprauli) to 31 sq km (Jani Khurd). The size of village in Chapprauli is 6.74 sq km per village, 3.964 sq km per village (Sardhana) and 3.136 sq km per village in Jani Khurd.

6.5 High Regularity (above 1.125)

Areas of high regularity comprises of only of two blocks of the District, i.e., Kharkhauda (1. 214) and Meerut (1.389), covering an of area of 7.31 per cent (269.5 sq km.), 7.55 per cent (68) of the total number of its villages and 7.47 per cent of its total rural population. The Density per 100 sq Km for Kharkhauda is 21 while for Meerut it is 34, which is the highest in the whole District. The uniform distribution of the settlements in these areas is the result of monotonous character of topography, uniform distribution of resources, fertility of soil, facilities of irrigation and means of communication and transport etc. The inter village spacing is 1.825 Km (Meerut) and 2.303 Km (Kharkhauda). The observed inter village distance is 1.18 Km (Meerut) and 1.3 Km (Kharkhauda) while the expected inter village distance 0.849 Km (Meerut) and 1.071 Km (Kharkhauda).

On the basis of the foregoing discussion it has been concluded that the trend of dispersion is always towards regularity. So Dacey's Regular

Poisson Probability Law[1] is most appropriate in this case because the empirical variance mean ratio is always smaller than 1 and the mean, in every case, is more than the variance, deviation index of nearest neighbour has also been tested with the use of normalized index of random disturbance whose intensity has been measured by using following mathematical formula.[2]

$$Di = ro \Big/ \left(1.0750 \Big/ \sqrt{d}\right)$$

Table 3.5 shows the normalized index (Di) values, in various blocks of the District ranges from 0.373 (Hastinapur) to 0.646 (Meerut), indicating a clear tendency towards regularity.

7.0 Types Of Rural Settlements

The word 'type' used here indicates the relationship between settlements within organized space,[3] which provides a distinctive view of the spatial organization. Most of the settlement geographers have classified the types according to their regional distribution patterns of such habitation on the basis of theoretical, empirical and associational considerations. In

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1. Dacey, M.F., "Modified Poisson Probability Law for Point Pattern more Regular than Random", *Annals Association of American Geographers*, Vol. 54, 1964, pp. 559-65.
2. Dacey, M.F. and Tung-Tze-Hsing, "Identification of Randomness in point- pattern, *Journal of Regional Science*, Vol. 4, pp. 83-96.
3. Doxiadis, C.A. (1968), *Ekistics, An Introduction to the Science of Settlements*, New York: Oxford Univ. Press, p. 33.

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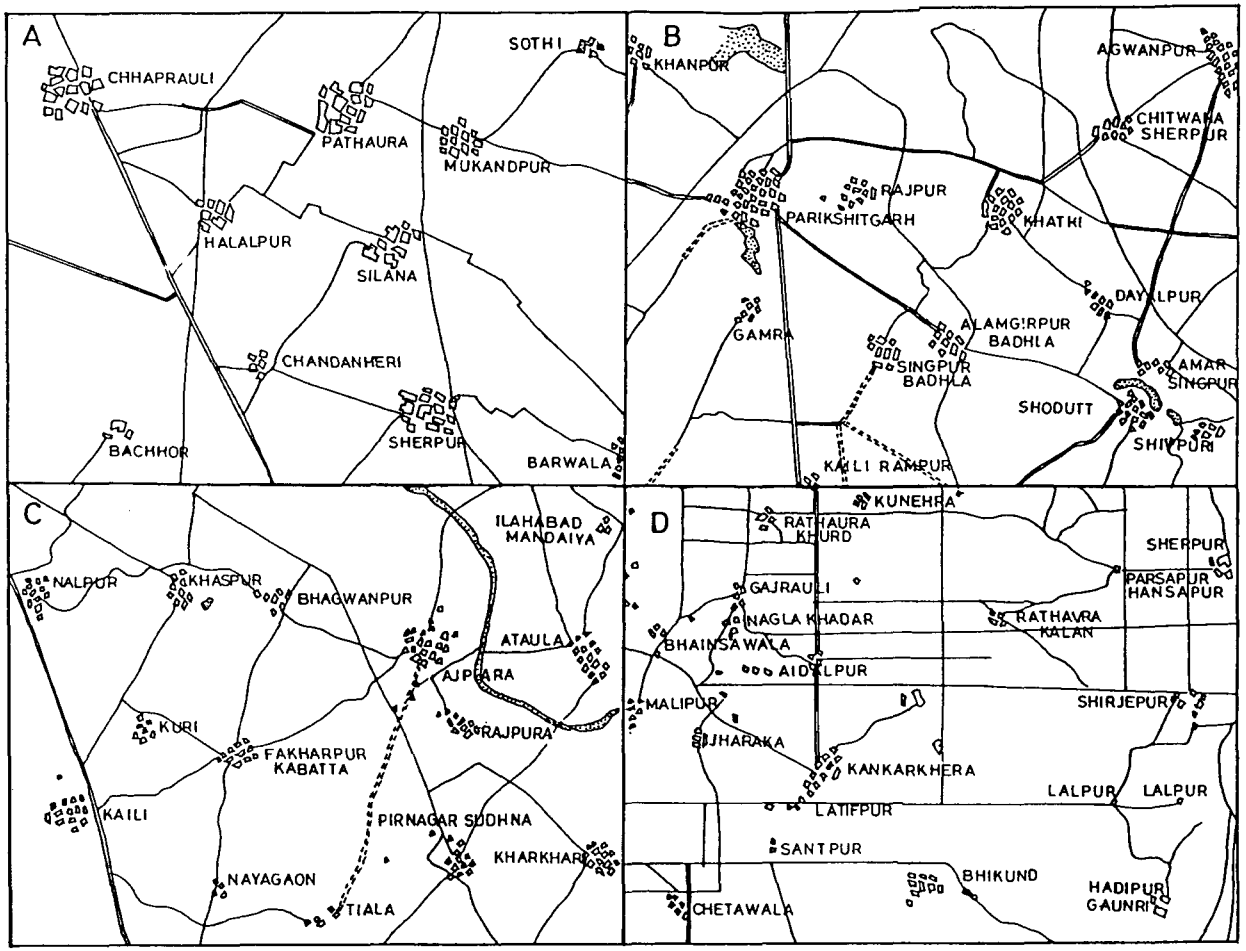
the Indian context, the term signifies the characteristic groupings of rural dwellings in that well-defined parcel of the ground, which is known as 'mauza'. But in regional framework, the term denoted the relationship between settlements within space. Thus, types are to be recognized on a large-scale map through the distribution of houses on one or more sites in a defined village territory. Various scholars have suggested many possible methods for classifying human settlements on the basis of size (e.g., large, medium, small etc.) siting (e.g., valley site, river site, road side villages etc.), functions (e.g., agriculture, fishing, commerce etc.), time (prehistoric, ancient, medieval, modern villages etc.). The present classification of rural settlements is based mainly on the pattern of nucleation of occupance units in a given space, which is an outcome of different physico-cultural factors. The settlements are classified into three types according to the spatial arrangement of the houses, i.e., compact, semi compact and hamleted (Fig 3.12). The compact settlements, also known by terms such as 'clustered', 'nucleated', or 'agglomerated', show very close spatial organization of the houses, i.e., houses are closely knit together and are separated by passages meant for traffic or circulation. The hamleted settlement indicate scattering of occupance units along the loose spatial structure .A perusal of the Topographical Sheets of the Survey of India (Scale 1cm = 500m) of the area coupled with field observation of the rural landscape of the Meerut

MEERUT DISTRICT
TYPES OF RURUL SETTLEMENTS



SOURCE :- SURVEY OF INDIA, TOPOSHEETS NO. 53 G/4, 53 H/13, 53 K/4

A&B – COMPACT
C — SEMI COMPACT
D — HAMLETED

ROAD
RIVER
SETTLEMENTS
TANK

1 0 1 2
Kms

FIG. 3.12

District reveals that there are wide variations in rural settlement in it. In this way, every settlement has its own distinct and unique personality[1].

Different scholars for the classification of rural settlement have presented a number of methods. Singh has proposed a scheme to identify settlement types taking into account the village and hamlet ratio of a village. If the number of villages are equal to the number of hamlets in a settlement, it is designated as, 'compact', if villages are less than half of the number of hamlets it is called 'dispersed' and if their number is more than half of the number of hamlets it is term 'semi compact'[2].

Villages, where houses are concentrated at central sites have been designated as 'compact'. Such concentration may have only one family or more than one hundred houses. Villages in which the number of hamlets vary between two and four, have been designated as 'semi-compact', whereas those consisting of five or more than five hamlets have been identified as 'hamleted'. Uninhabited villages have been ignored, and therefore the present study covers only 900 inhabited villages of the District.

7.1 Compact Settlements

Availability of water, productive agricultural land, means of communication provides better condition for the growth of compact villages.

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1. F.S.Hudson, *A Geography of Settlements*, London, Macdonald and Evans, (1970), p.3.
2. Singh, R.B., *Clan Settlements in Varanasi District,* N.G.S.I. Research Publication No. 12, Varanasi, National Geographical Society of India, (1975), p.134.

The rich alluvial soil attracted people since early historical times to live in groups and follow agriculture. The term 'compact settlement' signifies the concentration of almost all the dwellings of a 'mauza' (village) in one central site[1]. Compact settlements are found in large numbers throughout the District but they are common in Baraut, Saroorpur Khurd and Rajpura blocks.

Need for security from wild animals, clan solidarity particularly among the Rajputs and the Jats, the Jajmani system and prevailing social conditions, must have forced the people to congregate at one place under the shadow of their respective chiefs or leaders. At present, rural settlements of the area consist of a cluster of buildings in which streets are irregular in width and layout. The houses are irregularly placed with respect to the street frontage. Arable lands, fields, common pastures and orchards surround them. There may exist a common pond, a temple or a mosque in central part of the village. Thus "compact villages" are distinct and separate organism with its individual life and personality, which forms part of the landscape. The advent of modern means of transport such as railways and metalled roads and social customs of castes segregation have played an important role in disturbing the compact nature of such villages (Fig. 3.12 A, B).

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1. Ahmad, E., Rural Settlement Types in Uttar Pradesh United Process Province of Agra and Oudh, *Annals, Association of American Geographers*, vol. 42, pp.223-46.

7.2 Semi-Compact Settlements

The semi compact, an intermediary stage between compact and hamleted settlement, is characterized by the presence of a main village site along with one or two or more hamlets. The houses are neither agglomerated nor dispersed in numerous detached hamlets. These hamlets have direct linkage with the main site by footpaths or cart tracks. Such settlements are found in all over the District but common in eastern part of the region especially in Hastinapur block.

The development of hamlets around the main inhabited site reflect out growth of later periods by the people of diverse castes during settling process, sometimes as a separate grouping by aboriginals and low caste people in the neighbourhood of the main residential unit. There are examples of several villages where high castes have also formed the hamlets representing one family group (Kula). This process is very common in the villages lying along the roads. Besides, the outgrowth of the main or central site, a hamlet may also be formed due to the inhabitation of labour or service castes, existence of a place or worship or settling of immigrants from other villages. Such hamlets derive their names from the predominant caste residing therein e.g. Chamar Tola, Jatpura, Dhimar Patti etc. (Fig. 3.12 C)

7.3 Hamleted Settlements

The hamleted settlement is characterized by the presence of one

main site and several hamlets standing separate from one another spreading over the entire village area. Footpaths or cart tracks closely link these hamlets with each other. In such villages, physically separated clusters are closely associated with each other by cultural and social ties[1]. The division of the Indian villages into caste wards is the replica of the pre-Dravidian system, where different groups live more independently and separately by open interstitial space, but is joined together functionally. Rajput, Muslim and other Zamindars encouraged the system of the establishment of the hamlet. Land grants were made to establish separate 'purwa' or 'toli' fore various castes especially lower ones. It is also found that sometimes these outgrown hamlets are bigger in size than the main site and it is not easy to distinguish the original or main site from these hamlets. Physical environment, notably, the nature of the terrain and the drainage system, appear to be main factors, which have influenced the growth of hamleted or dispersed settlements in the District. Another important factor in the development of such settlements is agricultural operation. The time consumed in moving from the houses to the agricuitural field, the inconvenience in carrying agricultural implements to long distances, the watch and ward arrangements, etc. have also resulted in the emergence of hamlets. This type of transition belt is seen in the Ganga

1. Singh, L.R., *The Tarai region of Uttar Pradesh: A Study in Human Geography*, Allahabad, (1965), p. 53.

Khadar tract of the study area. It covers Hastinapur and Parikshitgarh blocks of the District (Fig. 3.12 D).

8.0 FACTORS AFFECTING RURAL SETTLEMENTS TYPES

The rural settlement types are the outcome of the interplay between various agglomerative and deglomerative factors.

8.1 Factors Leading to Agglomeration

I. Uniformity of Relief and Soil Fertility

Agglomerated type of rural settlement has been the chief characteristic of homogeneous leveled and fertile plains. Although soil variations are found all over the region, and even within the limits of the mauza boundary itself but its general productivity has enabled the rural population to live close together. The homogeneous stretch of fertile well-watered alluvial plains encourages large concentrations of rural settlements. The ever-growing population in such plains leads to intensive farming, which is also conducive to the concentration of settlements. The general sameness of the natural scene, coupled with an almost uniform fertility of the soil over most of the plain has fostered a sense of community life and motivated the people of the study area, to live in compact settlements.

II. Water Resources

The village water reservoirs ponds and *jhils* carved out with the excavation of earth for house building and even for water supply purposes

are a great source of water accumulation against the seasonal distribution of rainfall for irrigational facilities, bathing and other domestic purposes and are conducive to compact type of village settlement. In the areas of deep water table, owing to the difficulty and high cost of construction, masonry wells are infrequent and population clusters in compact villages around them; while in the zones of high water table, where such wells are more numerous because they can be cheaply constructed and there is no need to concentrate in one site so it is likely to spread out into several outlying hamlets. The need to store water against the seasonal distribution of rainfall and its vagaries is again conducive to the formation of compact settlements over higher and drier interfluves of the rivers. Near the rivers, construction of artificial embankments parallel to the streams as a protection from flood has encouraged the growth of agglomerated settlements along the river Ganga. Collective building of dams and irrigation channels for the storage and distribution of rain water and the construction of tanks for artificial irrigation, have also promoted the evolution of compact villages.[1]

III. Cultural Factors

The following are the cultural factors responsible for the establishment of compact settlements:

1. Man is the most gregarious animal and he tends to gravitate towards his fellowmen. Forest clearing, cultivation of land and related activities

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1. Singh, R.L., 'Evolution of Settlements in the Middle Ganga Valley', *National Geographical Journal of India*, Vol. 1, Part 1, September (1955), p. 102.

centralized at one place and agricultural cooperation and practices of the past as well as present have been conducive to compact settlements. Necessity for cooperation in the regulation and control of water, digging wells, upkeep of certain public works and preparation of the environment to make it favourable to crops.[1]

2. Fragmentation of holdings and strip cultivation present disadvantage to the village dweller, which are best, counterbalanced by nucleation where formers avail all the amenities of close and warm communal life. Blache rightly remarks that "concentration of living quarters is necessitated by the diversity of parcels to be cultivated because their only common meeting ground is the village, whither all paths lead.[2]

3. Rajput clans have helped the settlements to grow into compact habitations enclosed by mud walls, ditch or around a fortress doing the process of occurrence. To these were attracted groups of other people like priests, menials and artisans who aided in maintaining the solidarity, and self-sufficiency of the rural organization.[3]

4. The reciprocal relationships under the jajmani system have tended to maintain compactness since long. According to Enayat Ahmad the social gathering in the centre of the village usually under some shady tree or near the temple, the mutual rejoicings on festivals, the gathering of neighbours

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1. Vidal De La Blache, *Principles of Human Geography*, (English edition London), Ch. 1, ref. No. 10, 1926, p. 300.
2. *ibid.*
3. Singh, R.L., *op. cit.*

after the days work near the well in summer and round the fire in winter when tales are told and talks of friends and crops exchanged, all these have contributed their influence in the direction of compact settlement.[1]

5. Big cultivators or village Mahajan (money lender) exercises centripetal force for settlers.

6. Unemployed or semi-employed labourers engage themselves in the subsidiary occupations, which can easily flourish in such villages. Similarly, a host of intermediaries like petty traders find it convenient to supply articles of everyday life and purchase grains in times of need in compact villages.

7. Land system also associated the landlord and cultivator well in compact villages.

8. Religious centres along rivers and near springs also attract agglomerations around them. Temples in the middle of such big settlements still signify their historical role.

9. Some villages grow as compact settlements due to definite political bias or administrative decision.

10. Defence plays a significant role in agglomerations. During the eighteenth century no isolated habitation was considered secure unless protected by a fortification wall and ditch.[2]

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1. Ahmad, E., '*Rural Settlement Type in UP (United Province of Agra and Oudh)* Unpublished Thesis, (1948), p. 111.
2. Growse, F.S., '*Mathura: A District Memoirs*', New Delhi, Asiatic Educational Services, (1979), pp. 339-40.

11. Hall observes that compact village from is well adapted to the mode of life of a paddy area1. Various operations linked with paddy cultivation generate such centripetal force.

12. According to Mukerjee that the seasonal idleness of the peasant, especially marked in the rice region contributes to the development of a large variety of cottage industries, which can thrive only in compact settlements.

13. During old days, new site was rarely selected to live separately due to being inauspicious till it was approved of by a group of settlers after getting confirmation from the priests.

8.2 Factors Leading to Dispersion

I. Physical Factors

1. The dispersion appears to increase in direct proportion to the ruggedness of the land surface. The uneven nature of relief, soil and ground water results in the formation of scattered settlements. The Meerut District is marked by the presence of usar lands, broken terrain by small ravines, ponds and jhils, which have promoted semi-compact and hamleted types of settlements.

2. Abundance of surface water and high water table has also influenced the growth of fragmented settlements. When surface water in the form of

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1. Hall, R.B., 'Some Rural Settlement Forms in Japan in Japan', *Geog. Rev.*, Vol. XXI, No. 1, Jan. 1, (1931), p. 98

tanks and ponds is plentiful, each one of these may have a small hamlet around it. Of course, large tanks or tals may be conducive to large settlements. In areas where water table is high the construction of masonary or non-masonary well is cheap and easy and therefore it may be a suitable location for a small settlement.

3. Flood plains of large streams are also responsible for the scattering of settlements. In low-lying areas which are annually inundated during the rainy season, elevations, within the village are selected as suitable sites for establishing small hamlets, their number depending upon the number of elevated sites. The khadar lands of the rivers Yamuna and Ganga and Kali Nadi are flooded every year during the rainy season. As a result these areas are marked by the presence of semi-compact and hamleted types of settlements.

II. Cultural Factors

1. Socio cultural factors such as castes, prejudices and the existence of low agricultural castes have been partly responsible for the growth of hamleted settlements. The caste system based on social hierarchy divided the population into various social groups. At the lowest level of the social ladder are the supposedly low caste people, the so-called untouchables or Harijans, which include castes like, the Pasis, the Chamar and the Doms. These people have traditionally been forced to live a little away from the main site, often towards the south, while the upper castes occupied the

central site. Thus the caste hierarchy has also been responsible for the dispersion of rural settlements.

2. Land tenancy and absentee landlordism have also made their contribution towards fragmentation of settlements. Landlords used to settle near their holdings, and agricultural labourers, who were bound by loan or by cultivable lands given in return for services rendered, were required to stay a little away from the main habitation. As a result, the fragmentation of settlements took place. Besides this, most fertile fields were occupied by the landlords, while the less productive and poor lands lying away from the central site were under the possession of tenants, who will built their houses near their fields. After the abolition of the zamindari system, the actual tillers of the soil became free to settle anywhere in the village, causing further fragmentation of settlements.

3. Economic factors such as development of roads, railways and opening of new market service centres etc. have stimulated the tendencies towards hamletion of villages.

CHAPTER IV

PATTERN OF RURAL SETTLEMENTS-A QUALITATIVE AND QUANTITATIVE ANALYSIS

CHAPTER 4

PATTERN OF RURAL SETTLEMENTS – A QUALITATIVE AND QUANTITATIVE ANALYSIS

A rural settlement is a complex entity and its study pertains to the description and analysis of the distribution of buildings by which people attach themselves to the land. It is an occupance unit, represents an organized colony of human beings, including the buildings in which they live or work or store or use them otherwise and the tracks or streets over which their movements take place. The pattern, shape or the arrangements of the settlements are solely determined by physico-cultural and socio-economic conditions of the region. It is evident that an isotropic surface in terms of physico-cultural landscape is found absent in every region certain diversities do exist. Therefore it is obvious to find some variation in their pattern.

The word 'pattern' is often equated with the word 'shape'. However, there are geometrical dissimilarities between these two terms. A closed curve has a shape whereas a non-closed collection of points has a pattern.[1] A settlement therefore has a shape because its boundary is a closed curve, which circumscribes an area, or a space of two dimensions. The pattern of

1. Bunge, W., *Theoretical Geography*, Lund: Lund Series (c) in Geography. (1962), pp. 73-74.

points are zero dimensional objects whose pattern is operationally determined by the relative distances or spacing of the points with respect to one another.[1] According to the basic properties, pattern can be classified into three categories:(i) those having the patterns of Euclidean geometry, (ii) those which are independent of scale and density, and (iii) those which may be expressed the relative spacing of the individuals in the distribution.[2] In this context it may be noted that a single distribution may have different patterns at different quadrant sizes.

Settlements pattern denotes the shape or arrangement of settlements in relation to natural or man-made feature such as streams, ridges, canals and roads.[3] It is determined on the basis of the location of houses and highways. It bears the shape of settlements, and the relationship between one dwelling and another, sometimes irrespective of site.[4] In the study of the settlement patterns two fundamental things have to be taken into consideration. First, the pattern should be abstracted from the habitat. Secondly, the pattern should also depend upon the kind of houses people wish to construct. It may consist of cattle sheds, granaries and out

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1 Hudson, J.C. and P.M. Fowler, "The concept of Pattern in Geography" in *Man Space and Environment*, P.W. English and R.C. Mayfield, London: Oxford University Press (1972), p. 545.
2 *Ibid.*, p. 548.
3 Jan O.M. Brock and John, W. Webb, *Geography of Mankind*, New York, (1967), p. 242.
4 Joney Emrys, *Human Geography*, London, (1965), p. 115.

houses. Sometimes a store, a garage, a post office or a school may also determine the pattern of settlement.

Villages differ greatly from one another in shape and pattern by reason of differences in the arrangement of streets and houses. As a matter of fact, the street system within a settlement is the most crucial element because houses are generally built facing a street or a road. Moreover, cultural elements such as the location and places of worship, sometimes give a distinct character to a dwelling site. The study of a settlement pattern comprises two aspects i.e., (i) the external layout and (ii) the internal plan. As stated in the preceding chapter, both these aspects are closely related to various geographical conditions, such as location, configuration of land, surface water (rivers, canals, tanks, ponds, wells, etc.), the nature of soil, vegetational cover, and shape of the cultivated fields.[1] Beside these physical conditions historical events, cultural traditions, patterns of roads and streets and other features such as temples, mosques, churches, garrison etc. also influence the settlement patterns. The state of insecurity in the past and the present social ethos of the rural society are other significant factors in the development of pattern.[2] Grouping of houses due to certain reasons assumes different forms as a result of which many distinct patterns emerge. There may be settlements where no pattern is recognizable. As such, patternlessness becomes a pattern in itself and is usually the consequences of criss-cross working of various causes and

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1 Ahmad, E., *Social and Geographical Aspect of Human Settlements*, New Delhi, Classical Publications, (1979), p. 99.

2 *Ibid.*, p. 99.

function of a settlement.[1] Arrangement of houses is conditioned through the factors like roads, cart tracks, and water facilities, while lanes from the skeleton of the layout of a village. Buildings located in the space within the skeleton determine the shape and form of the village, as does the flesh in the human body.[2]

1.0 HISTORICAL ANALYSIS

Apart from age-old social mores and hierarchies regulating the Indian village community, the broad, determining features of rural settlement patterns seem to be four. First, the terrain and water point; second, the needs of cultivation; third, the needs of security and defence; and the fourth, the inter-relationships and hierarchy of castes and the strength of the jajmani system. From the ancient period up to this age these factors determine the different patterns of settlements. Therefore, the study of its historical evolution based on archaeological evidences, historical sources, toposheets and field surveys become very important.

The Jain texts speak about Uttanamalla Kakara (looking like an open bowl) in Avanmukha (circular in pattern), Khanda (Semi-circular), Patalika (avenue pattern), Valabhi (settlement with the trees planted at the four corners) and Ruchak (with uneven ground ringed with trees).

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1 Anas, M., "The Pattern of Settlement in the Sub Himalayan Region (East)" *The Geographer*, Summer, (1954), p. 32.

2 Dickinson, R.E. *The town plan of East Anglia: A study in Urban Morphology*, Vol. 21, (1934), p. 37, and Mandal, R.B., *An Introduction to Rural Settlements*, New Delhi, Concept Publishing Company, (1979), p. 145.

Mansara Shilpshastra and Arthashastra have description about rural plans of Aryan villages. The pattern was based on the swastika marking the cross roads of an Aryan village which runs north and south and east and west. They were terminated at the four gates dedicated to four positions of the sun.[1] According to Mansara Shilpshastra, there are eight types of Aryan villages, Dandaka, Sarvatobhodra, Nandyavarta, Padamaka, Swastika, Prastara, Karmuka and Chaturmuka (Fig. 4.1). It explains that most of the plans were rectangular or square shape. A wall surrounded each village with a ditch for defense purposes. There was generally a gate in the middle of each of the four quarters. A temple, a tank or a public hall usually occupied the centre of village. Straight streets further subdivided the four quarters. Members of a particular caste or profession inhabited each block; the best quarters were generally reserved for Brahmins and people of other high castes. The easterly axis of the general plan and the intersection of the main street by north south running shorter street bore relationship with climatic conditions. Such an arrangement ensured the advantage of sunlight and proper ventilation. These plans have, however, been obliterated, modified, during the long period of history and only relics are visualized in the form of fortresses or walled villages.

The ancient literature and the archeological excavations have shown that the study area has been occupied since pre-historic times. There are a large number of mounds in the district known as 'khera', kheri, tikri, pahar,

1 Bushman, K.H., "Settlements and Habitations in India", *Geographical Review of India*, Vol. 16, No. 3, September (1954), p. 19.

PATTERN OF RURAL SETTLEMENT IN ANCIENT PERIOD

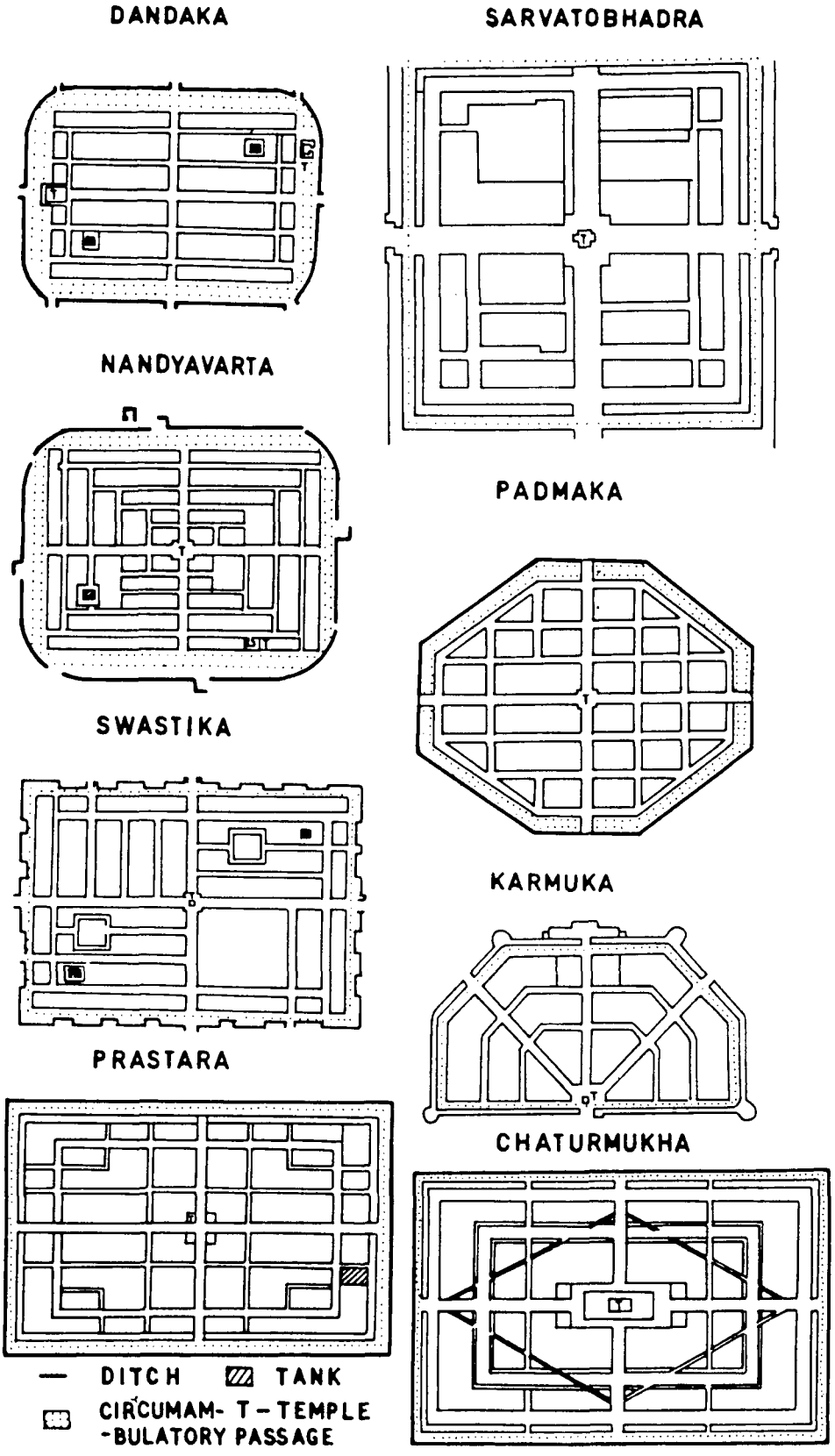

FIG. 4.1

etc. spread all over the region. These villages do not seem to survive at present in their true forms but they tell their story by its appearance. Hence, the study of the present village patterns is of vital importance. The study of a village plan is made with reference to the layout of the inhabited site based on the arrangement of houses and village streets or lanes. This may be clearly visualized in compact and semi-compact villages.

The present analysis is concerned with the concept of bounded space, "in which one's legally defined rights and obligations change when crossing the boundary,[1] while perceptual space may not be demarcated or defined due to high variation in perception concept. The territorial limits of a village and its built up area form a geographical space or bounded space, within which its inhabitants live, move and perform their economic and social activities. The analysis of residential area as well as villages become significant as it is observed that territorial spaces in which locational decisions are made, are determined by the correlation between bounded space and other geographical factors. An attempt has been made here to deal with the traditional view of shape analysis as well as the geometrical form of shapes.

2.0 SHAPE ANALYSIS: TRADITIONAL APPROACH

Since late nineteenth century, the emerging methodologies indicate the traditional or classical view of shape analysis, mostly followed by

1 Cox, R.R., *Man, Location and Behaviour: An Introduction to Human Geography*, New York: John Willey (1972), p. 120.

Meitzen (1895) in dealing with the classification of rural settlements of Germany on the basis of their forms and patterns. Demangeon has added to this in the morphological structure of villages and their plans in describing village shape.[1] Hall used the external forms of settled areas, while studying Yamato Basin, as a basis for the classification of village patterns.[2] Other European geographers have followed his method. In India Singh has initiated this approach, in describing the layout of villages in the middle Ganga valley. According to him, the entire village is divided into a number of squares or rectangles, each forming separate strips of farms, pastures of gardens with definite fields boundaries like fixed village limits.[3] In a settlement pattern, two elements are common, i.e., the main inhabited site and the hamleted site while the structural arrangement of inhabited sites vary in their shapes.

The present analysis of village pattern is primarily concerned with clustered settlements. The congregation of a number of dwellings and arrangements of associated lanes give rise to different village patterns. So the compact and semi-compact settlements are taken into consideration. Villages of varying shapes have been selected for this analysis from the Survey of India's Topographical Sheets on the scale of 1 cm to 500 meters

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1 Singh, A.K., "*Ballia District: A Study in Rural Settlement Geography*". The National Geographical Society of India, Varanasi, 1985. p.83.

2 Hall, R.B., "Some Rural Settlement Forms in Japan", *Geographical Review*, Vol. 21, (1931), pp. 93-123.

3 Singh, R.L., "Evolution of Settlements in the Middle Ganga Valley", *National Geographical Journal of India*, Vol. 1, (1955), p. 109.

or 1: 50,000. The selected villages have been checked during the field survey. The region under study has a long historical background and varied physical conditions. The area has several patterns of villages influenced by diverse, physical and cultural conditions.

Rectangular Pattern

This is the most common shape of the nucleated settlements. This is not only true for this district, but also for other parts of India, China, Japan and Italy. The main causative factors for this pattern in the rectangular division of land were prevalent in ancient times known as the bigha system, comparable with the jori system of Japan, han-den of China and jugerium of Italy.[1] Rectangular pattern is also mentioned in the Mansara.[2] In India, bigha system is based on square units, which is responsible for the emergence of this pattern of settlement. The rectangular alignment of dwellings with their main axis from north to south and east to west is also designed to get maximum sunlight and fresh air. The other advantages of this shape lie in maximum accommodation of dwellings in a number of rows parallel to each other. In brief, whenever human habitations are agglomerated, the plan of the village conforms broadly to rectangular shape and when it did not have a natural growth, the pattern is generally irregular or roughly rectangular or square. Kayasth Ganwri, Aichi Khurd, Aichi Kalan etc. are some of the examples of this pattern (Fig. 4.2, A1, A2, A3).

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1 Singh, A.K, "*Ballia District: A study in Rural Settlements Geography*", The National Geographical Society of India, Varanasi (1985), p. 84.

2 Ahmad E., *Social and Geographical Aspects of Human Settlements*, New Delhi, Classical Publications, (1979), p. 100.

PATTERN OF RURAL SETTLEMENTS

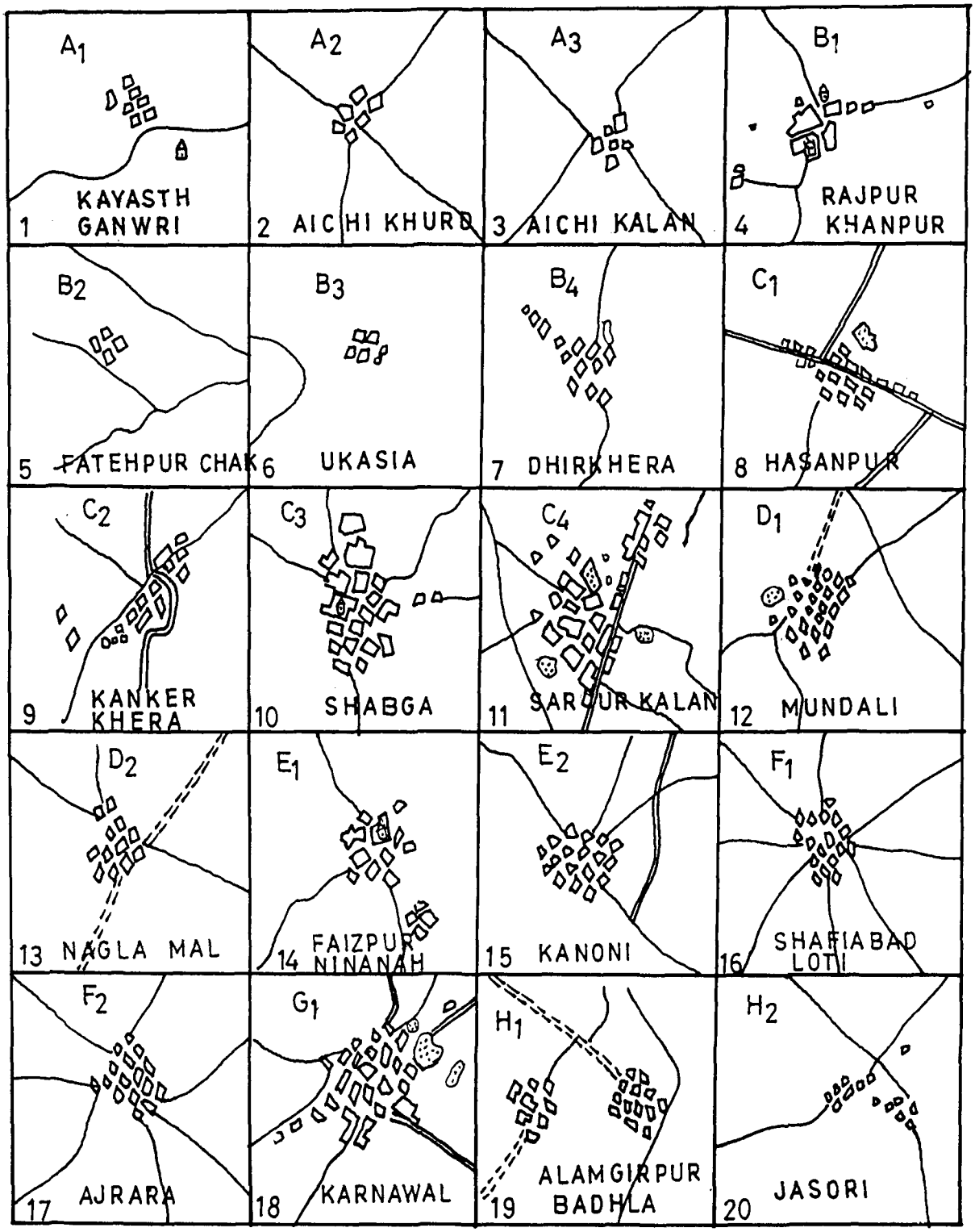
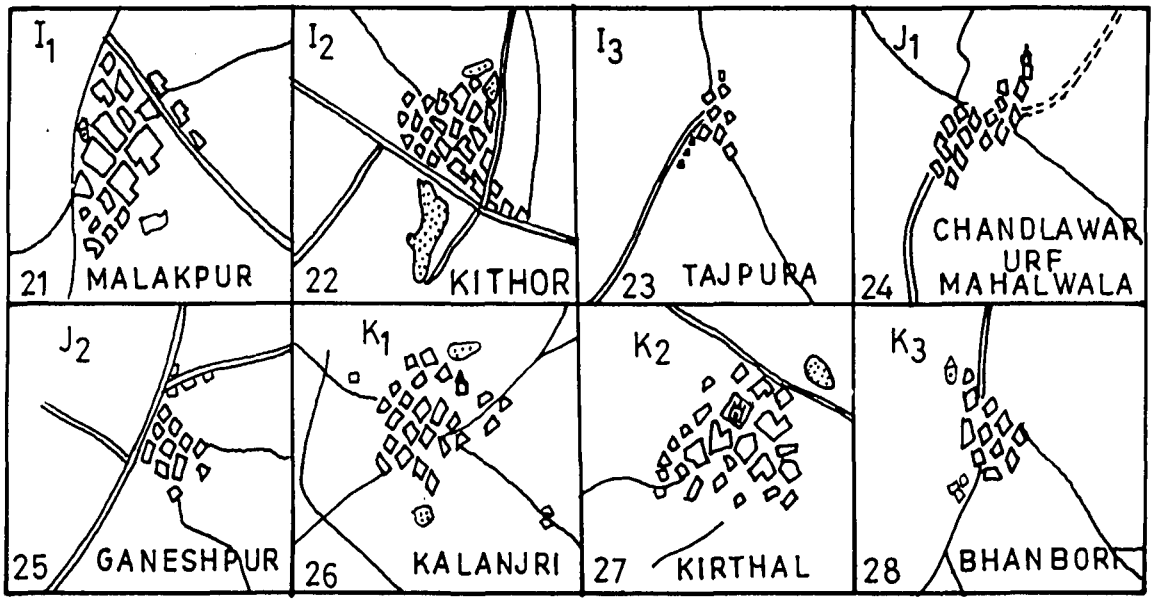


FIG. 4.2

PATTERN OF RURAL SETTLEMENTS



HABITATION

METALLED ROAD

UNMETALLED ROAD

CART TRACK

POND

TEMPLE

MOSQUE

SOURCE : SURVEY OF INDIA TOPOGRAPHICAL SHEET NO $53\frac{G}{4}$, $53\frac{G}{8}$, $53\frac{G}{12}$, $53\frac{G}{16}$, $53\frac{H}{9}$, $53\frac{H}{13}$

FIG.4.2

Square Pattern

The square and the rectangular patterns are complementary to each other. Due to attractive but restrictive physical forces in a village site a square settlement may turn into a rectangle one, and vice versa. The crossing of cart tracks or roads leads to the formation of this pattern. Villages lying at the intersection of two cart tracks give rise to four distinct blocks, all in square in shape. Existence of thick grooves, tanks or ponds, road etc. restricts the growth of houses outside the squares. Sometimes there is an unbuilt space is present in the centre owing to the presence of a tank or a temple or mosque or a garden or by any other feature. Some of the good examples of square pattern of settlement in the Meerut district are Rajpur Khanpur, Fatehpur Chak, Ukasia and Dhirkhera (Fig. 4.2 B1, B2, B3, B4).

Elongated or Linear Pattern

The linear pattern is recognized by the arrangement of houses along a line or a series of lines. The settlement is prolonged in one direction and restricted in another due to certain physical features. The occurrence of this type of pattern is associated with the flood affected areas and proximity of a river. Whenever the site is a narrow strip in between two streams flowing very close together the village becomes elongated. Among cultural factors metalled or unmetalled roads and railway lines also result in the elongation

of villages. Roads and cart-tracks attract the people to settle along them. In the past the danger of troops or organized robbers attacking the villagers prevented the growth of settlements along the roads, but now a days considerable number of market villages may be seen along transport lines. Hasanpur, Kankerkhera, Shabga, Sarurpur kalan are some of the best examples of elongated type of villages in the Meerut district (Fig. 4.1, C1, C2, C3, C4).

Grid Iron or Chess-Board Pattern

Gridiron or the chessboard plan denotes a "right angled mesh of streets with or without central rectangular market place".[1] Chessboard pattern in the feature of some large rectangular and square villages. In such large settlements two streets corresponding with the four gates of the village wide enough to allow the passage of bullock-carts cut each other at right angles. A few other subsidiary lanes run parallel to the main lanes, in order to provide access to other houses of the village. Generally the village is divided into tolas based on different castes and each grid may be occupied by one caste. Some of the examples of gridiron pattern in the study area are Mundali, Naglamal etc. (Fig. 4.2, D1, D2).

Circular Pattern

This pattern may have several variations, resulted from an attempt to build a maximum number of houses at one site. The houses may be

1 Dickinson, R.E., "The Town-Plans of East Anglia: A Study in Urban Morphology, *Geography*, Vol. 21, (1934), p. 74.

concentrated for the purpose of defence, or around a well or around the mansion of the local zamindar. This pattern is a heritage of the past, particularly of the eighteenth and nineteenth centuries, when the security of the villagers was uncertain. According to Ahmad[1] the circular form was a natural result of maximum aggregation for the purpose of defence, around the mansion of the local zamindar, who used to protect the peasants against a for-ay by a neighbouring chief. Sometimes a semi-circular plan may develop on the crescent shape of a meander. In some cases natural barrier like shallow marshes or lakes, etc. or religious buildings like temples or mosques, ponds, wells or market places etc. also produce such a circular pattern. Due to the presence of these cultural features in the centre, hollow circular pattern is developed. In the study area Faizpur Ninanah and Kanoni are the best examples of circular pattern (Fig. 4.2, E1, E2).

Radial Pattern

Radical pattern is quite similar to the circular pattern with a slight variation in the internal as well as external structure of the layout. The radial pattern of settlement is conditioned by the radiating character of cart-tracks or lanes, which converge on a central point, such as the houses of zamindar, a place of worship, a sweet water well or village shop etc. Shafiabad Loti and Ajrara villages are the examples of such types (Fig. 4.2, F1, F2).

1 E. Ahmad, *op. cit.*, p. 105.

Star Pattern

When the circular settlement extends in several directions along the footpaths and roads, the village assumes star shapes. The occurrence of such settlements also takes place with the construction of new dwellings on the fringe of circular and square shaped rural dwelling on the fringe of square shaped settlements. Village Karnawal is a good example of star shaped pattern (Fig. 4.2 G).

Double Nucleation

Where the two settlements develop at a single site it is called 'double-dorfer'. In rural areas a minor stream is often the cause of such a pattern. Sometimes a mound, a road, a tank or a river may result in the development of twin settlements situated on either side of it. It is also caused by the construction of new shops at the railway station. Though the distance may be one or two kilometres from the parent village. Examples of such villages are Alamgir Badhla and Jasori (Fig.4.2, H1, H2).

Triangular Pattern

Such a pattern usually occurs on a site where the growth of the settlement is restricted on three sides by certain physical or cultural factors. Cart tracks, roads, rivers etc. may restrict the growth of a settlement. This pattern may also come into existence at the junction of three roads. The best examples in the District are Malakpur, Kithor, Tajpura etc. (Fig.4.2,I1, I2,I3).

L-Shaped Pattern

L-shaped pattern is a subsidiary pattern of the rectangular or square form. It comes into existence when two roads or cark-track meet at right angles and attract the people do settle along them. This pattern is found only in Chandlawar urf Mahalwala and Ganeshpur (Fig. 4.2, J1, J2).

Amorphous Pattern

In case the village lanes are dotted with tiny hamlets all being small rectangles linked with the central site by footpath, because dispersion of houses with result such an irregular fashion of piling of houses are made, which leads to a scattering of dwellings over the entire area is known as amorphous pattern. The villages Kalanjri, Kirthal and Bhanbori are the good example (Fig. 4.2., K1, K2, K3).

3.0 SHAPE ANALYSIS: GEOMETRICAL APPROACH

The quantitative approach of shape analysis is based on the elementary packing theory. In a territory, having various shapes of village boundaries, the efficient division can be best explained in two ways: (i) having efficiency of movement and (ii) having efficiency of boundaries. The first, involves distance minimization in between centre and outer margin,

the second, is measured by perimeter length of the territory.[1] The second criteria are more valid because decision and movement are closely associated with village boundaries. As a matter of fact, three geometrical properties, area, shape and connectivity, are the characteristics of bounded space where any simply connected shape can be represented by a polygon with any number of sides of equal or variable length.[2] Circles tend to have an infinite number of sides and vertices, but their series over a region either tend to overlap or to leave a number of gaps. So three kinds of regular tessellations, i.e., triangle, square, hexagons (Fig. 4.3) are most suitable for packing an area where hexagon retains most of the characteristics of a circle in terms of minimizing the distance, movement and absence of any gap. Here the circle is considered to be an ideal geometrical figure owing to its maximum packing capacity, compactness and better accessibility. So the circular geometry has been used for the computation of shape in the present analysis.

Early theorists like Christaller and Losch have used the hexagonal shape to explain spacing, distribution and settlement area. However, it has been lately observed that a rectilinear or rhomboidal pattern of latticecould also serves as an alternative to the hexagonal area[3].

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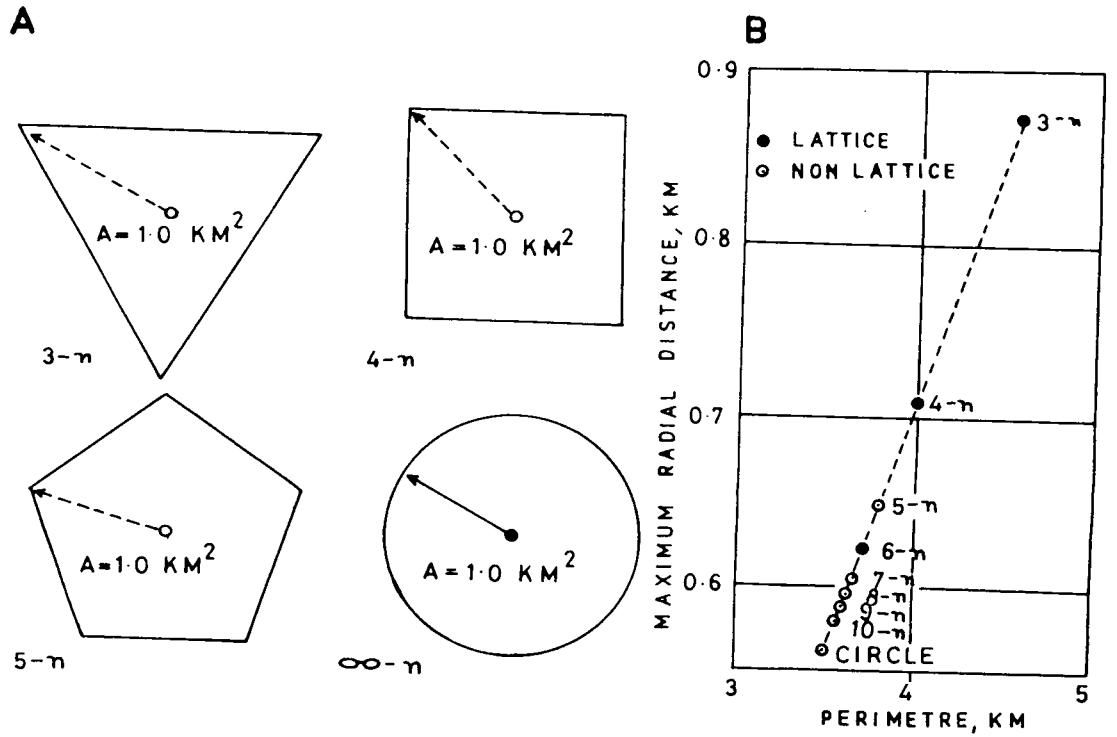
1. Haggett, P., *Locational Analysis in Human Geography*, London, Edward Arnold, (1965), p. 48.
2. Bunge, W., *Theoretical Geography*, London (1962), Ch. 4, pp. 73-74.
3. Berry, B.J.L., *Geography of Market centers and Retail Distribution*, New Jersey: Prentice hall, (1967), Chapter 4.

EFFICIENCY OF ALTERNATIVE TYPES OF REGULAR POLYGONS IN RELATION TO DISTANCE FROM CENTRES AND PERIMETER LENGTH



FIG· 4·3

The concept of shape measurement started from the work of Thompson in biological sciences.[1] In geomorphic studies Miller, on the basis of quantitative expression of the shape of the river basin, used circulatory ratio. He concluded that drainage shape S, could be expressed as the ratio of the area of the drainage basin, Ab, to the area of the circle having the same perimeter Ac, i.e., S = Ab / Ac.[2] The same formula has been adopted by Haggett[3] in the shape analysis of Brazilian settlements where shape Index (S) of a village may be expressed as the ratio of the area of the village (A) to the area of the circle with the longest axis (L) as a perimeter (πR^2). So that

$$S = \frac{A}{\pi R^2} \text{ or } \frac{4A}{\pi L^2} \quad \text{or} \quad S = 1.27\frac{A}{L^2}$$

Where,

A = area of the county in km^2.

L = Longest axis of the county as a straight line connecting the two most distant points on the perimeter.

Here the multiplier, 1.27 is computed to adjust the shape index ranging from 1.00 (a circle) to zero in elongated shape. The values are 0.42 for triangular, 0.64 for square and 0.83 for hexagonal shapes. To represent

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1. Thompson, D'Arey, *On Growth and Form*, Cambridge University Press, Cambridge (1917), Revised in 1942.
2. Miller, V.C., *A Quantitative Geomorphic Study of Drainage Basin Characteristic in the Clinch Mountain Area, Virginia and Tennessee*, New York: Columbia University, Deptt. of Geology, Technical Report 3, (1953).
3. Hagget, P., *Locational Analysis in Himan Geography*, London: Edward Arnold (1965), pp. 50-52.

the shape ratio of a circle in percentage, multiplier of 100 may be added. Simmons, Boyce and Clark, have analyzed the shapes of urbanized areas rather than their population using the frame work of circular geometry, while Wilkins and Shaw have taken the population attributes as well as urbanized area and have also tried to develop formulae for the measurement of shape distortions and their testing procedure.[1]

The methodological principles adopted for the analysis of shape of rural settlements, the measurement of shape of rural settlements given by Miller, have been used, because of its simplicity. There are 900 inhabited villages in the District, only 10% villages i.e., 90 have been selected on random basis to under go the shape analysis. Shape indices obtained as per Miller's formula for 90 sample villages of the District are given in Table 4.1 which shows that 56.76 per cent of the sample villages i.e., 51 lie between the shape indices of 0.3 and 0.7, the average shape index of the study area is 0.638. A perusal of Table 4.2 shows that 17.78 per cent of the villages conform roughly to rectangular or square shape. This is mainly due to the rectangular system of land division, i.e., bigha system, prevalent during earlier times. There is no village which represent very elongated shape i.e, < 0.1 while nine villages approach nearly circular shape i.e., > 0.9. They are Chhachharpur, Shabga, Bohla, Dagarpur, Mavi Kalan, Rithali, Tigri, Pali and Sarangpur. The frequency of villages in different shape

1. Singh, R.P.B., "*Clan Settlements in the Saran Plain (Middle Ganga Valley): A study in Cultural Geography*", National Geographical Society of India, Banaras Hindu University, Varanasi, (1977), p. 150.

Table 4.1
Shape value of sample villages

S.No	Village	Population	Area in km^2	Density in persons /km^2	Contact number (C.N.)	Shape Index (S.I.)
1	Asara	10095	9.61	1050.46	7	0.603
2	Khawajgipur Chandanheri	1670	1.89	883.59	6	0.784
3	Ibrahimpur Majra	2496	2.48	1006.45	6	0.787
4	Chhachharpur	1372	3.77	363.92	7	0.946
5	Shabga	9327	14.14	659.6	6	0.994
6	Bohla	723	2.23	324.21	4	0.979
7	Angadpur	2039	4.72	431.99	7	0.567
8	Alawalpur	2189	2.26	968.58	7	0.755
9	Saroorpur Kalan	10822	9.97	1085.45	7	0.791
10	Sujra	1776	3.15	563.81	7	0.640
11	Gwali Khera	1855	2.64	702.65	4	0.662
12	Bali	4744	3.84	1235.42	5	0.694
13	Basaud	4727	5.47	864.16	7	0.798
14	Matanatnagar	2293	2.42	947.5	4	0.607
15	Dolcha	4506	8.27	544.86	5	0.420
16	Saidpurkhurd urf Nathmalpur	450	1.83	245.90	5	0.644
17	Makarandpur Ogti.	822	0.98	838.77	5	0.864
18	Pali	2257	4.18	539.95	4	0.702
19	Noorpur Khalsa	210	0.80	262.5	5	0.839
20	Fakharpur Mohd. Shahpur	5049	3.18	1587.7	4	0.448
21	Dagarpur	2945	2.23	1320.6	3	0.920
22	Bhagot	3673	1.96	1873.9	3	0.81
23	Daha	8460	9.85	858.8	6	0.677
24	Palra	2160	2.15	1004.65	6	0.539
25	Bamnauli	9673	12.89	750.42	11	0.462
26	Dadri	796	2.579	308.64	8	0.310
27	Nagla Rawa	1483	1.6579	894.5	5	0.416
28	Mavi Kalan	4621	8.14	567.69	6	0.978
29	Rithali	645	1.90	339.47	4	0.943
30	Pathauli	3444	5.02	686.05	7	0.520
31	Bahadurpur	2958	3.4893	847.73	6	0.419
32	Salawa	8290	13.99	592.56	3	0.547
33	Chandna	1027	1.793	572.78	4	0.598
34	Tanda	1552	2.5302	613.39	5	0.635
35	Nagla Rathi	1449	2.26	641.15	5	0.621
36	Barkali Nekpur	2604	5.5066	472.88	5	0.832
37	Panwari	1949	2.14	910.74	7	0.753
38	Batjeora	1310	2.06	635.92	3	0.807
39	Nagli Ajar Salempur	2206	3.82	577.48	5	0.746
40	Bihta	641	0.88	728.40	4	0.715
41	Sanota	2971	2.87	1035.19	7	0.753
42	Meerpur	647	1.71	378.36	3	0.543
43	Jhunjhunee	2283	6.75	338.22	8	0.864
44	Bisola	3803	5.58	681.54	7	0.443
45	Tigri	2485	1.61	1543.47	5	0.908

46	Kherki Jadid	1616	1.82	887.9	5	0.849
47	Batawali	1914	4.25	450.35	5	0.383
48	Chamraud	461	3.85	119.74	5	0.671
49	Hastinapur Kaurwan	199	8.53	23.32	8	0.480
50	Pali	1854	2.24	827.67	5	0.928
51	Dhuma Nagli	510	1.11	459.45	3	0.551
52	Sujatpur	291	1.53	190.19	5	0.634
53	Shirjepur	510	6.10	83.606	5	0.733
54	Bajampur	1295	5.43	238.48	7	0.212
55	Bali	2315	4.28	540.88	5	0.718
56	Khaikhera	1307	2.25	580.8	6	0.564
57	Achi Khurd	2101	3.60	583.61	6	0.731
58	Meerpur Sadhunagal	343	4.3	79.76	5	0.302
59	Amar Singhpur	2081	3.42	608.47	5	0.574
60	Chhuchai	2782	3.94	706.09	5	0.638
61	Sarangpur	700	5.47	127.97	5	0.918
62	Manpur	2025	2.9	698.27	5	0.487
63	Khandrawli	2234	3.44	649.41	5	0.485
64	Mohd. Muradpur urf. Sholda	2900	4.65	623.65	4	0.841
65	Kithor Rural	1471	9.39	156.65	6	0.745
66	Kalina	2743	4.3	637.90	6	0.388
67	Baram	2709	5.5	492.54	10	0.570
68	Dilwara	564	2.62	215.26	5	0.719
69	Ukasia	900	4.64	193.96	7	0.509
70	Khwajampur Majra	1079	2.91	370.79	4	0.455
71	Bahrampur Khas	4104	3.89	1055.01	5	0.218
72	Chak Morna	60	0.86	69.767	4	0.758
73	Jani Buzurg	4546	5.48	829.56	8	0.446
74	Rasulpur Dhaulri	9487	6.96	1363.07	3	0.721
75	Siwal Khas	193	7.08	27.259	9	0.522
76	Ajnauli	772	1.72	448.83	5	0.713
77	Mahroli	2413	3.71	650.40	5	0.753
78	Jurranpur	733	1.68	436.30	5	0.386
79	Allipur Jigmana	2851	4.99	571.34	8	0.638
80	Sikhera	3491	3.85	906.75	6	0.646
81	Amehra Adipur	3716	2.65	1402.26	4	0.538
82	Kastala Shamshernagar	3334	4.49	742.53	8	0.634
83	Medpur	2660	3.08	863.63	6	0.626
84	Jithauli	1847	2.96	623.98	5	0.447
85	Khanpur	880	1.42	619.71	4	0.588
86	Govindpur	798	1.44	554.16	4	0.633
87	Amipur Nagola	3132	3.93	796.94	3	0.554
88	Dhir Khera	2221	3.72	597.04	3	0.295
89	Shafiabad Loti	4173	7.85	531.59	3	0.551
90	Ikla	969	1.76	550.56	5	0.393

Source: Compiled from District Census Handbook Meerut, (1991).

groups has been plotted in Fig. 4.4 A, which represents the triangular, square and hexagonal lattices, and reveals a general trend from elongation to square, and the area does not show the gaps among groups of frequency distribution of shape index as in the case of Brazillian counties.

The second characteristic of shape analysis associated with the hexagonal tessellations in the number of contacts between any one territory and the adjacent territories. In the regular hexagonal system the contact numbers is 6, while for the triangle the number is 3, and 4 for the square. The contact numbers in the sample villages have been shown in Table 4.2 along with the histogram (Fig. 4.4 C).

The mean contact number of sample villages is 5.422, which is near to 6 observed in a strictly hexagonal system, which may be referred as the representative of the study area. This is further corroborated with the fact that 63.3 per cent of the sample villages record contact number between 5 and 7. The contact index as exhibited in table 4.2 and Fig. 4.4 B showed that 87.8 per cent of the sample villages have contact indices between 1 and 3.

There appears to be no correlation between contact index, population density, and shape index (Fig. 4.5) because of the homogenous nature of the region. Due to some forces of attraction population density becomes very high at some places. Table 4.3 gives a list of selected

Table 4.2
Shape characteristics of selected villages

Shape Index			Contact Index			Contact Numbewr		
Group	Frequency	%	Group	Frequency	%	Group	Frequency	%
0.1 – 0.2	0	--	< 1	19	21.1	3	10	11.1
0.2 – 0.3	3	3.33	1 – 2	43	47.8	4	14	15.6
0.3 – 0.4	6	6.67	2 – 3	17	18.9	5	31	34.5
0.4 – 0.5	12	13.33	3 – 4	7	7.8	6	13	14.4
0.5 – 0.6	16	17.78	4 – 5	2	2.2	7	13	14.4
0.6 – 0.7	17	18.89	5 – 6	1	1.1	8	6	6.7
0.7 – 0.8	19	21.11	6 – 7	1	1.1	9	1	1.1
0.8 – 0.9	8	8.89	7 – 8	0	-	10	1	1.1
0.9 – 0.10	9	10.0	> 8	0	-	11	1	1.1
	90	100.00		90	100.00		90	100.00

Source: Compiled from District Census Handbook Meerut, (1991).

Table 4.3
Special characteristics of selected villages

	Villages	Area in Km^2.	Population Density in persons per Km^2	Shape Index	Contact Number	Contact Index
A	Circular and semi circular					
	Shabga	14.14	659.6	0.99	6	0.42
	Bohla	2.23	324.2	0.97	4	1.79
	Mavi Kalan	8.14	567.6	0.97	6	0.73
b	Hexagonal					
	Noorpur Khalsa	0.80	262.5	0.83	5	6.25
	Barkali Nekpur	5.5	472.8	0.83	5	0.90
	Kherki Jadid	1.82	887.9	0.84	5	2.74
c	Square and Rectangular					
	Sujra	3.15	563.8	0.64	7	2.22
	Saidpurkhurd urf Nathmalpur	1.83	245.9	0.64	5	2.73
	Sikhera	3.85	906.7	0.64	6	1.56
d	Triangular					
	Dolcha	8.27	544.8	0.42	5	0.60
	Nagla Rawa	1.66	894.5	0.41	5	3.02
	Bahadurpur	3.49	847.7	0.41	6	1.72

Source: Compiled from District Census Handbook Meerut, (1991).

MEERUT DISTRICT
CHARACTERISTICS OF VILLAGES SHAPES

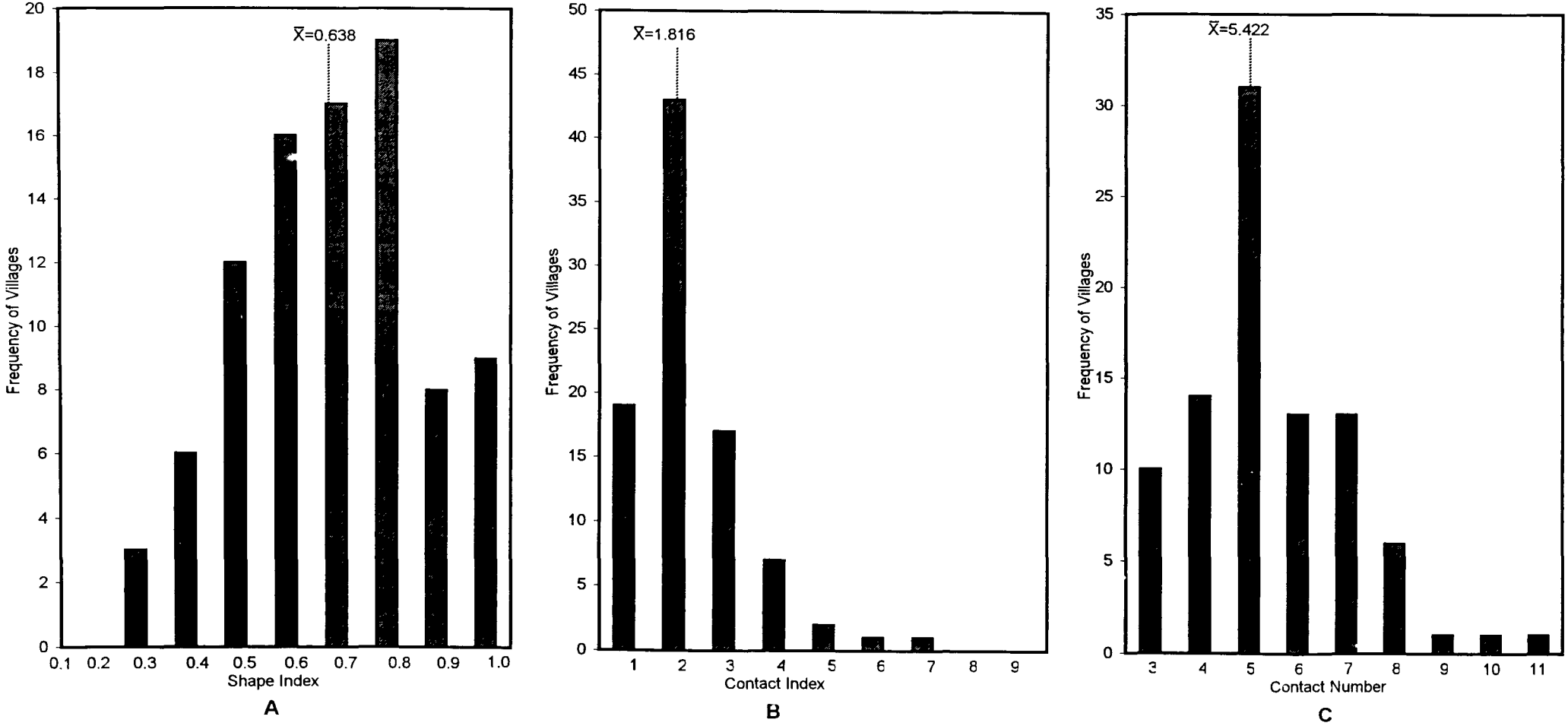

FIG. 4.4

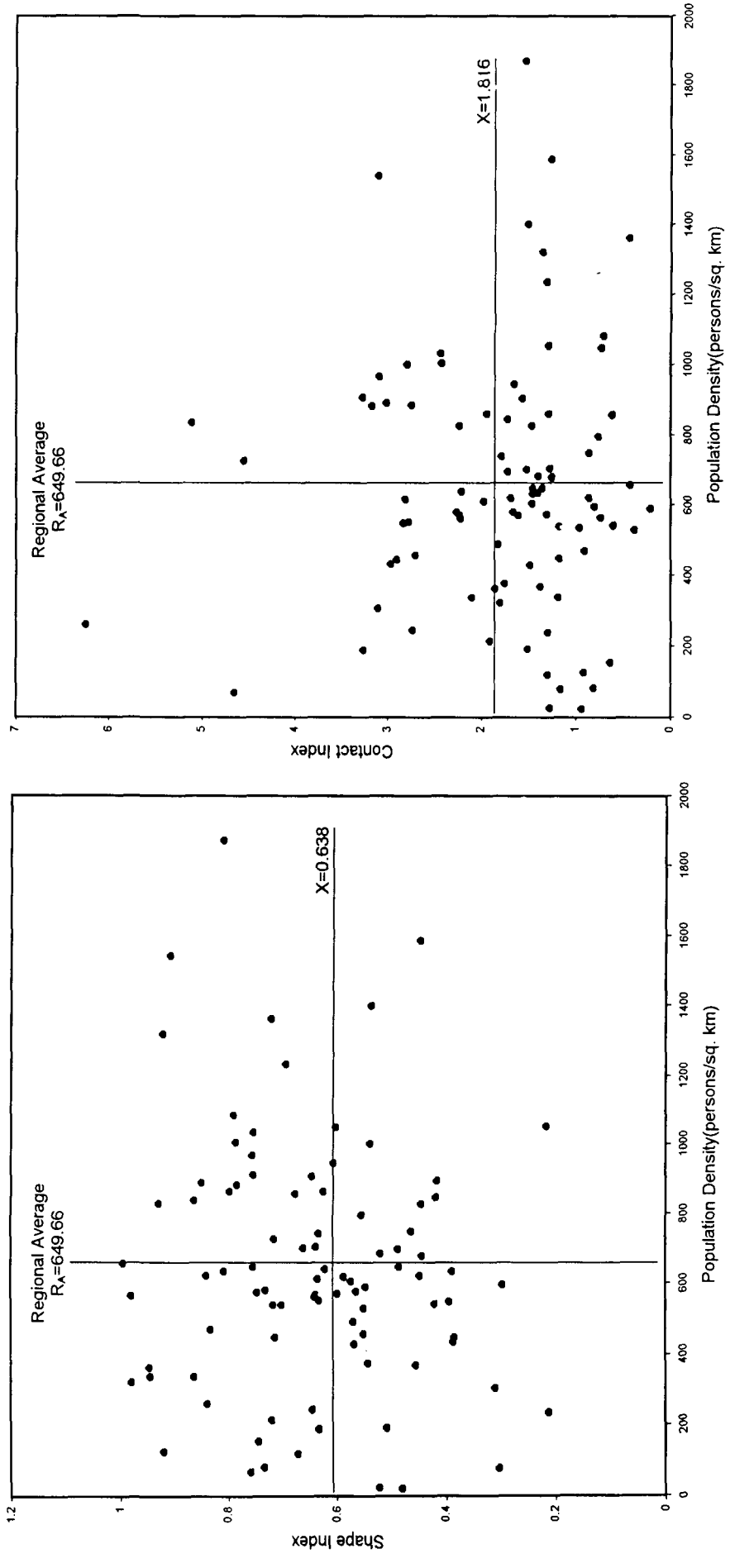
MEERUT DISTRICT
RELATIONSHIP OF CONTACT INDEX, POPULATION DENSITY & SHAPE INDEX
(90 SAMPLE VILLAGES)
Regional Average
R_A=649.66
X=0.638
Shape Index
Population Density(persons/sq. km)
Regional Average
R_A=649.66
X=1.816
Contact Index
Population Density(persons/sq. km)

FIG. 4.5

villages showing various categories of village shapes to highlight the relationship between shape and area / population of the sample villages.

Transformation of Village Shapes

The concept of transforming village shapes is analyzed within two perspectives of constructing serial polygons making delaunay triangles and cellular nets, the hexagon. Although its root goes back to mid nineteenth century (1850),[1] when mathematician Dirichlet introduced the concept of serial polygons, the detailed properties have been studied later on by D'Arey Thompson (1917). Such space exhausting polygons are known as 'cellular net' in geography, 'mosaics' in ecology, 'Thiessen polygon' in meteorology, 'Dirichlet' or 'Voronoi' in mathematics. Instead of the equilibrium system of economic and spatial area, Dirichlet found tessellation of serial polygon with maximum packing density, which he defines as, 'the ratio of the area of a circle to the area of a polygon in which the circle is inscribed'. Since this density will be evidently less than 1, the required polygon will have density closest to 1. Thiessen polygon implies that diagonals are drawn between village sites and perpendicular bisectors are erected to form a network of serial polygons.[2] The main advantage of such polygons lies in the fact that they enclose within them areas that are nearer to the village centre than to any other centre and no change in the

1. Singh, R.P.B. *op. cit.*, p. 153.
2. Kopec, R.J., "*An alternative Method for the Construction of Thiessen Polygons*", *The Professional Geographer*, 1963, Vol. 15, No. 5, pp. 24-26.

existing village site is necessary to have effective control over the enclosed territories. The other method, that of the hexagon, used by W. Christaller (1933) in his 'Central Place Theory' is based on the concept of uniform space and is very popular in geographical writings owing to its maximum packing capacity and uniform size.

It is difficult to use this method for a broader region, however, samples may be taken for comparative study. Three areas of discrete ecological settings from different tehsils. (Fig 4.6, A1, B1, C1) have been taken for the present analysis. It is found that village sites are mostly associated with attractive forces (physical and cultural) and market centres have been developed at the intersection of roads.

The transformation of village boundary into regular polygons indicates that, as the number of market centres increases, sales in individual market centre decreases. This trend denotes the low cumulative purchasing power of persons inhabiting in the region concerned. Within this frame, Christaller's k3 value can also be tested which will show inverse relationships, that is, an increasing K value signifies better economic efficiency of a region, as shown in (Fig. 4.6 A3, B3, C3), according to which it has increased from 7 to 9 in one case and to 21 in another.

The transformation of village shapes into the hexagonal system is comparable to the theory of connectivity, which follows from 'Christaller's

TRANSFORMATION OF VILLAGE SHAPES INTO THIESSEN POLYGONS AND HEXAGONS

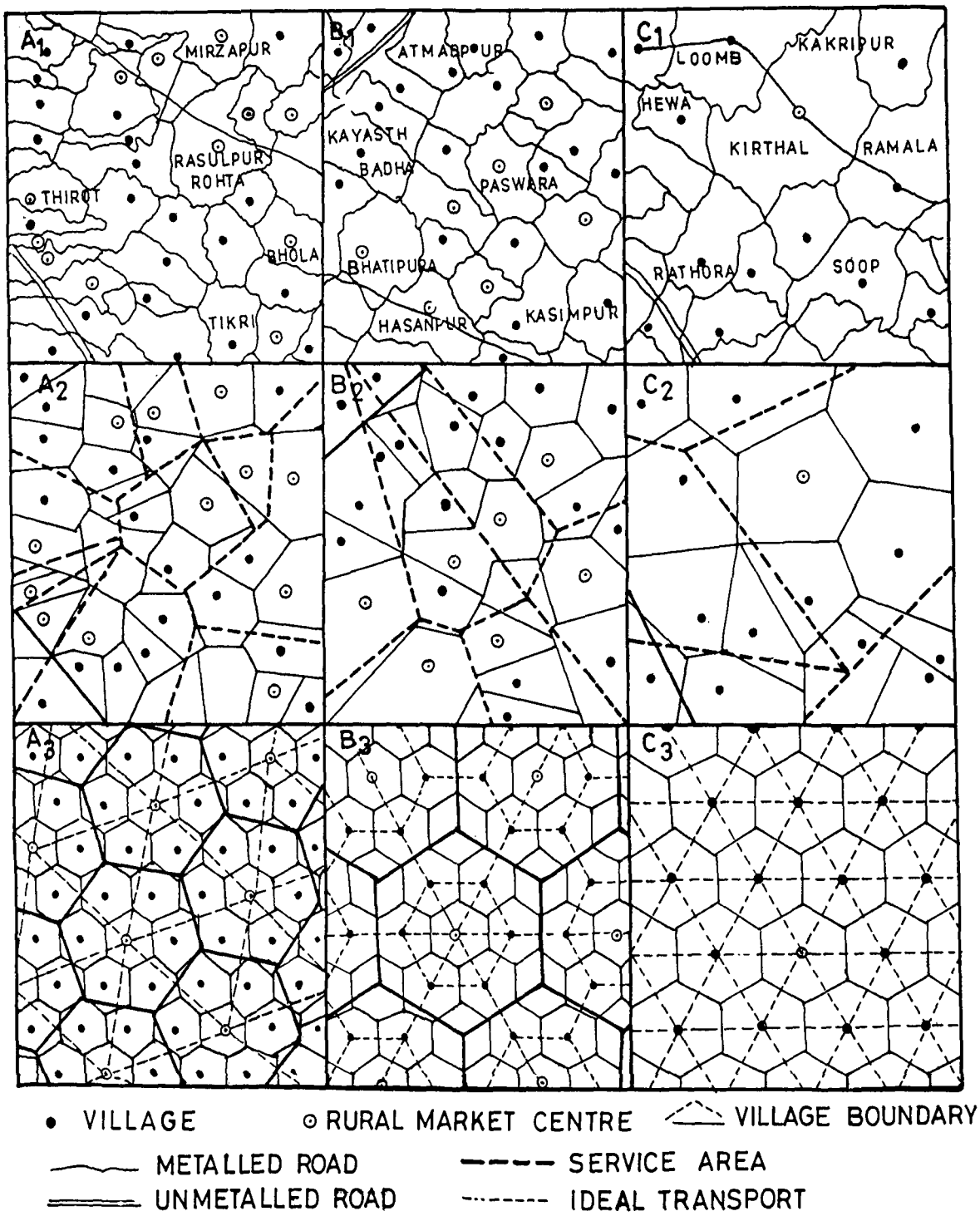

FIG. 4.6

traffic principle.[1] In fact, increasing K value affect connectivity in the same fashion as may be clearly seen in (Fig. 4.6 A3, B3, C3) where the increasing k value signifies increasing trend in connectivity by denoting better purchasing power. It is significant that Thiessen polygon are the most suitable for the transformation of village shape into regular polygons, because in this method the settlements are taken into consideration as they are (Fig. 4.6, A1, B1, C1).

From the foregoing discussion it may be concluded that the shape analysis by qualitative method indicates the role played by different physico-cultural factors operating in a region whereas quantitative analysis gives the picture of an ideal pattern of settlement. So village shape analysis is most useful, as a tool for the purpose of village planning.

1 Christaller, W. '*Central Place in Germany*, translated by C.W. Baskin, Englewood Cliffs, Prentice Hall, New Jersey, (1966), pp. 72-73.

CHAPTER V

RURAL DWELLINGS AND HOUSE TYPES

CHAPTER 5

RURAL DWELLING AND HOUSE TYPES

The dwellings are the representative of the human imprint upon the physical landscape, showing the people's traditional as well as modern achievements pertaining to a changing scene, thus depicting various niches of the complex structure of man-environmental relationship through various dimensions, as Brunhes has also advocated that the houses are the products of cultural traditions and natural conditions.[1]

The term 'rural dwelling' includes not only the residential houses ranging from the humblest huts of the poor to the most elaborate and massive city mansions, but all other human structures as well such as schools, factories, warehouses, Churches, Mosques, Temples etc.[2] A house may be defined as the structure or part of the structure, inhabited or vacant, a shop or a shop cum-dwelling or a place of business, workshop, school, etc. with a separate entrance. A house is used by man as a resting place to recoup his lost energy and also to protect himself from the vagaries of weather and wild animals.

Agglomeration of houses marks the origin of settlements and reflects the nature of the region, since their character is related to the environment and the cultural heritage of the people.[3]

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1 Brunhes, Jean, *Human Geography*, Chicago: Rand McNally (1920), p. 74.
2 Finch, V.C. and G.T. Trewartha, *Elements of Geography: Physical and Cultural*, New York, (1946), p. 553.
3 Dickens, S.N. and Pitts, F.R., "*Introduction to Human Geography*", New York, (1963) p. 199.

Since the dawn of human civilization, physico-cultural and socio-economic factors played significant role in determining the character and composition of rural dwellings. It is the best manifestation of the environment, which may be seen in layout, plan, nature of building materials, and morphology. As such, a peasant's house is of great geographical interest since it is a reflection of the direct influence of the environment. Peasant's dwellings are rather simple in their structure and layout. Geographical fashion in combination with socio-economic factors produce an architecture in which faction or style plays little or no role. The peasant, with most meagre resources at his disposal constructs a simple structure, using locally available building materials. Therefore, it is obvious that rural dwellings reflect the cultural heritage, functional needs and positive and negative aspects of non-cultural environment.

The study area is an almost homogenous level plain. It is a part of the Ganga-Yamuna doab, drained by two major rivers in the east and west, Ganga and Yamuna respectively, and a number of minor rivers in between. Although it is a uniform plain, there exist diversities at micro-level in physico-cultural and socio-economic conditions. Similarly, variations in religious rituals and caste structure are also found throughout the region. These factors determine the form, layout, architectural design and building material of the rural dwelling in the region.

Rural house types in the District clearly indicate the influence of physical environment as well as cultural, on the form, function and structure of houses. For example, available building material points to the micro regional characteristics of geology, soil and vegetal cover. The size and height of the houses and use of different materials indicates the economic condition of the people. The climatic elements, particularly, temperature, wind direction, and rainfall, influence the orientation and structure of rural dwellings. Flat mud roofs, a salient feature of the rural houses of the District, distinguish these houses from those in other parts of the Upper Ganga-Yamuna Plain. This type of roofs effectively keeps off internal heat, and if well laid, may last upto years under normal conditions. Climate remains the main consideration of the people while building their houses facing the east instead of the west. The former are better ventilated and receives sunrays of early morning, while the latter are subjected to the scorching after-noon sun, as well as westerly dust storms in the summer season. An open courtyard is an inseparable feature of rural houses because it provides ample sunshine and heat to the inhabitants during the winter and a comparatively cool place for sleeping during summer nights. Different mode of activities of the people result in differences in the structure, styles, sizes and plans of the houses of tradesmen, blacksmiths, carpenters and shopkeepers etc. Similarly institutions such as schools,

banks, hospitals, post offices, panchayat buildings etc. are designed to meet their specific needs.

1.0 EVOLUTION OF RURAL DWELLINGS

Historical and archeological evidence clearly reveals that rural dwellings in the study area go back to 1800 BC. This is borne out by the legend and folklore of the area, by the presence of a large number of mounds, and more convincingly, by the archeological excavations in different parts of the District. The present form of rural dwellings is the outcome of thousands of years of cultural and economic progress in the study area. It is known that settled life began with the Neolithic age. It is generally believed that the earliest form of human dwelling was the cave.[1] Then people started living in man-made dwellings, i.e., thatched huts, along the tributaries of major rivers or near other water bodies. The shape of the huts, in all probability, must have been circular or oval. It is presumed that the pre-historic men, taking their clue from shady trees like the banyan, constructed their first circular huts constituting of reed, twigs, tree leaves etc. in the forest of the region to lead a more sedentary life.[2] These types of houses are still seen along the Yamuna, Ganga and Kali rivers of the District. In due course, these huts were clustered together and the whole settlement was protected with fencing of tree trunks and bamboo etc. Some

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1 Relgan, L. "The Origin Vernacular Architecture" in cultural and environment ed. 1 Foster, London, (1963). p. 373.

2 Tiwari, R.C., "Settlement System in Rural India: A case study of the lower Ganga Yamuna Doab, Allahabad Geographical Society, Allahabad (1980), p. 248.

of these huts were arranged in rectangular or square shape. Thereafter, as a result of the development of economy and improvement of skills, an addition of courtyard was made to each of them, which provided protection for the cattle besides, having other functions.[1] Brown bricks and stones were the predominant building materials during the Buddhist period.[2] Archaeological remains of the Gupta and the Harsha Vardhana period suggest that the arts flourished in the District.[3] During the ascendancy of the Moes, Kols and Bhars, a change took place in the pattern of the dwellings of the region. Their houses were generally made of clay and wood with circular and rectangular structures using reeds or thatching grasses to construct conical roofs on wooden poles.[4] During the Mughal period most of the tombs, mosques and buildings built by the rulers show magnificent blending of Indian and Persian architecture in the District. The Maqbara of Shah Pir, a noted Muslim Saint, the Jama Masjid and a few gates exist even today these are the Shahpir Gate, the Sohrab Gate, the Budhana Gate, the Khairnagar Gate etc. Stones seems to be the most common building material used during this period.

Similarly, during the British period, new types of building materials like cement, brick, lime and Iron-bars gained wide popularity, especially in the construction of government building. But the rural dwellings were

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1 Havel, E.B., "Ancient and Medieval Architecture of India, London (1915), p. 12.
2 Atkison, E.T., Statistical, Descriptive and Historical Account of the North Western Province of India, Vol. 2, Meerut Division, pt. 1, Allahabad (1875), p. 517.
3 Ray Chaudhuri, H.C. "*Political History of Ancient India*", (Sixth ed.) pp. 112-113.
4 Siddiqui, J.M. *Aligarh District: A Historical Survey*, Aligarh, (1981), pp. 22-25.

deprived of such material. Only the mansions of the affluent people like Zamindars, Jagirdars and public buildings used this material. In post-independence period, certain changes in the structure and plan of the rural dwellings have taken place due to improvement in the socio-economic conditions of the people. Burnt brick, cement, mortar, iron bars, stone slabs which were earlier used only by affluent people or in public buildings, are now being used even by the people belonging to the middle income group in the District. The majority of the rural houses in the region continue to be built with available local material like mud, wood, thatching grass, etc.

2.0 DISTRIBUTIONAL PATTERN OF RURAL DWELLINGS

The distributional pattern of rural settlements and their types in the region are intimately related to nature of terrain, type of soils, facilities of water supply, means of transport and agrarian economy of the people. All the physico-cultural and socio-economic factors encouraged the origin, growth and pattern of dwellings in the region. The distribution and characteristics of rural dwelling is not uniformly made through out the study area because of existing apparent physico-cultural and socio-economic devastation at micro level. The density of the rural houses has been calculated, taking into account all the revenue areas of the village including agricultural lands, orchards and wastelands, since data of the built-up area of the village settlement is not available. For calculating density, only the

actual area under settlement should have been taken into consideration. But due to non-availability of relevant data, the density of rural houses / sq km has been calculated on the basis of the number of occupied residential houses of a block / area of the block.

The form, function and structure of the house types are mostly governed by the socio-economic conditions of the people on the one hand and physical environment on the other. According to 1991 census, there are 3,18,185 rural houses in the District with an average density of 86.28 houses per square kilometre.

Table 5.1 shows the density of rural dwellings per square kilometer of the District at the block level. The maximum and minimum densities 119.78 houses / km^2 and 42.93 houses / km^2 are found in Rajpura and Hastinapur blocks respectively. Higher densities are found in Baraut (112.51), Jani Khurd (102.75), Meerut (106.31) and Rajpura (119.78). It is due to the fertile soil, better means of irrigation and transport while the lower densities are due to usar lands and poor means of irrigation and transport i.e., Hastinapur (42.93) and Parikshitgarh (63.63). Fig. 5.1 shows the density of rural dwellings in the District.

3.0 MORPHOLOGY OF RURAL DWELLINGS

The physico-cultural and socio-economic factors of the region have caused variations in building materials, ground plan architectural styles,

TABLE 5.1
DISTRIBUTION OF RURAL HOUSE AND DENSITY AT BLOCK LEVEL (1991)

S.No.	Blocks	Area in Sq.Km.	Number of Occupied Residential Houses	Density
1	Chhaprauli	182.0	17370	95.44
2	Baraut	235.8	26530	112.51
3	Baghpat	187.0	18351	98.13
4	Pilana	203.6	19053	93.58
5	Khekra	162.7	15644	96.15
6	Binauli	297.9	24783	83.19
7	Saroorpur Khurd	204.4	17487	85.55
8	Sardhana	186.3	16807	90.21
9	Daurala	189.2	17247	91.16
10	Mawana Kalan	221.6	17914	80.84
11	Hastinapur	349.4	15001	42.93
12	Parikshitgarh	318.7	20280	63.63
13	Machra	185.6	16224	87.41
14	Rasulpur Rohta	154.5	14331	92.75
15	Jani Khurd	175.6	18044	102.76
16	Meerut	72.1	7665	106.31
17	Rajpura	163.9	19632	119.78
18	Kharkhauda	197.4	15822	80.15

Source: Compiled from District Census Handbook Meerut, (1991).

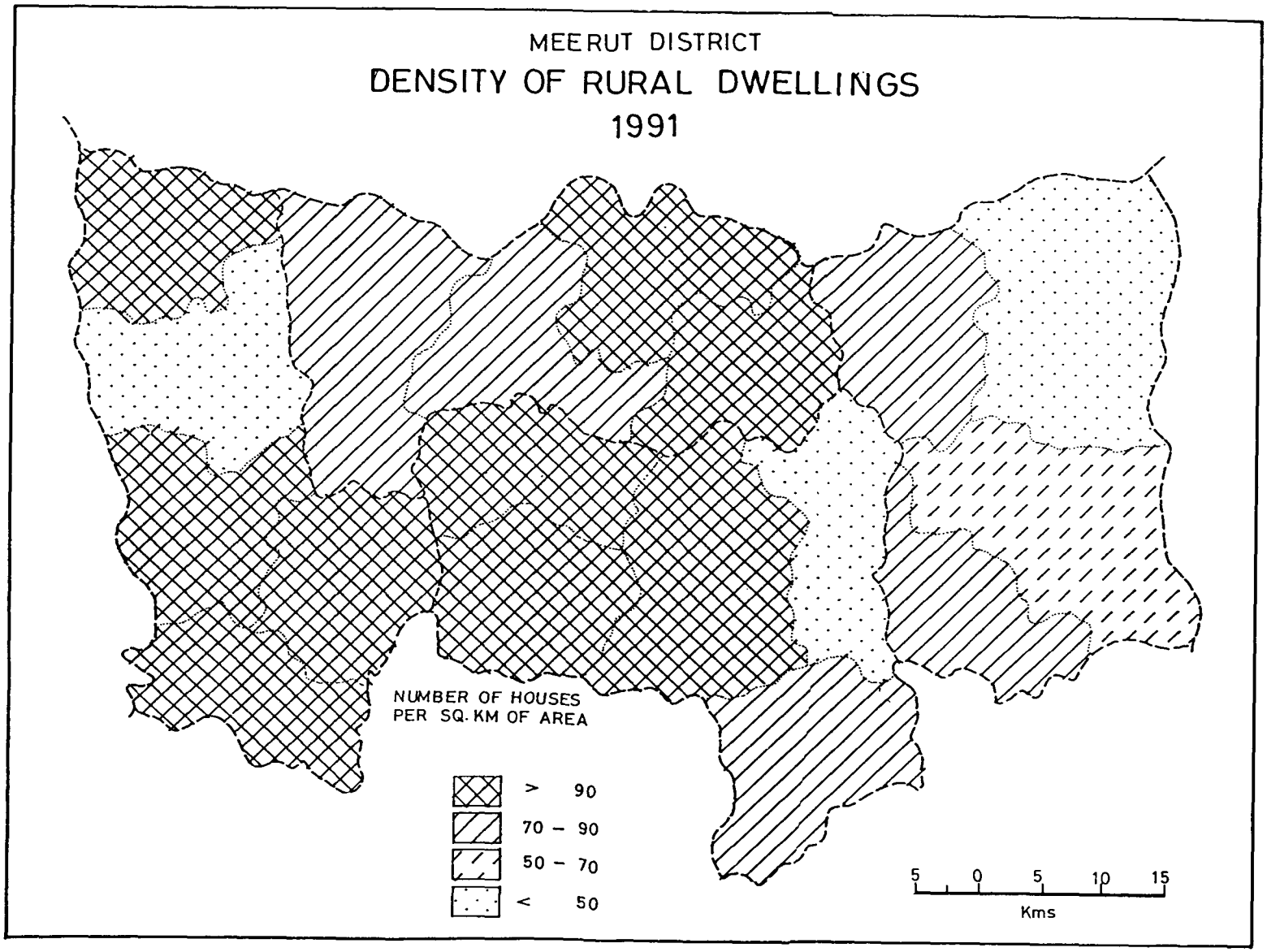

MEERUT DISTRICT
DENSITY OF RURAL DWELLINGS
1991
NUMBER OF HOUSES
PER SQ. KM OF AREA
> 90
70 – 90
50 – 70
< 50
5 0 5 10 15
Kms

FIG. 5.1

size and shape of the dwellings. However, certain features of rural houses such as courtyard, verandah and raised platform have been found to be common in most of the north Indian rural dwellings.[1]

3.1 Courtyard

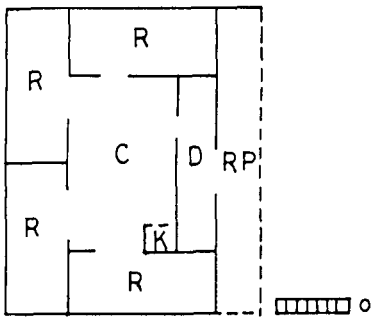
Courtyard is the most distinguish feature of the traditional Indian rural houses. This courtyard locally known as angan - a rectangular open space, north south oblong is surrounded usually on four, three or two sides by rooms and the remaining sides by walls (Fig. 5.2). The main entrance of the house is generally located in the fourth wall, which is built only for the privacy of the angan of the house. The courtyards in the houses of upper and middle class people are used for maintaining family privacy, while poor people consider it as the best source of relief from congested accommodation and a place where they can keep their cattle and agricultural implements. It compensates the lack of sun light in the ill ventilated compact rooms of the dwellings and is also used for sleeping purposes of female members as well as for various indoor works i.e., sunbasking during the winters, drying, grinding, threshing, cooking and various social and religious activities.

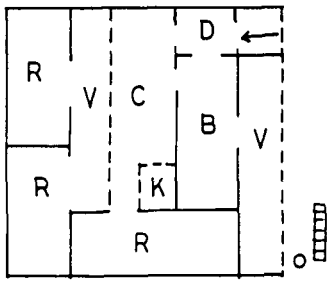
The courtyard represents rectangular open space of diverse site, size, shape, situation, function and surroundings depending upon the need,

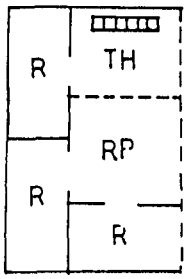
1 Misra Ashoka, "House type in India", *The Illustrated Weekly of India*", November 10, 1968, p. 26.

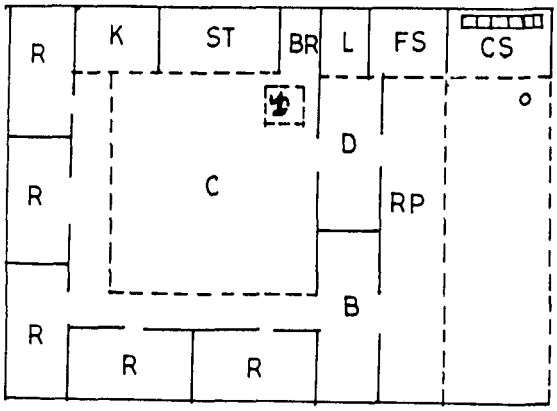
MEERUT DISTRICT

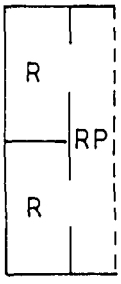
MORPHOLOGY OF RURAL HOUSES

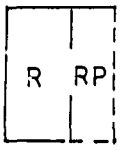












R — ROOM
V — VERANDAH
D — DUBARI
B — BAITHAK
K — KITCHEN
ST — STORE
BR — BATHROOM
L — LAVATORY
FS — FODDER STORE
RP — RAISED PLATFORM
CS — CATTLE SHED

CATTLE PEN
HAND PUMP
WELL

4 0 4
Mts

FIG. 5.2

available space or only the whim of the occupants. Its situation and layout are also an indication of status of the occupants. The most common occurrence of the courtyard is in the backside, where it is surrounded by an inner verandah, attached to the main or by the wall of these rooms, and an outer wall, rarely having a door found in modern type dwellings.

3.2 Verandah

Another notable feature of rural dwellings in the region is the roofed or thatched verandah. Males use the outer verandah, in front of one side of the main door, mainly, for sitting, receiving guests, keeping fodder, poultry and goats in poor houses and for sleeping purposes. Especially in rainy season sometimes it is also converted into shop for selling small items of daily need (Plate No. 5.1). It is also used as a work place by village craftsmen like carpenters, blacksmiths and weavers (Plate No. 5.2). The inner verandah extends over the entire length of the courtyard on one, two or three sides. These verandahs are well supported by walls of mud or burnt or unburnt bricks or wooden pillars. Some verandahs have kitchen, others, a store place for implements and some cattle folds. Their presence provides light to the inner rooms, protect walls from rain showers, keeps floor inside dry and enables fair approach to the rooms during rains and also to cattle for feeding and milking. Mostly, the well-to-do dwelling's

5.1 A well maintained shop in a rural house

5.2 Dwelling cum workshop

verandah has a Jhoola.[1] It also serves the purpose of sitting, sleeping, chattering and gossiping.

3.3 Raised Platform

A raised platform or chabutra in front of the main entrance is an integral part of the rural houses of the area. It is corrupted in the village parlance to chauntra. The males use it as a meeting place in the evening. Since this platform faces a lane or street the women belonging to the upper and middle class families rarely use it because they are supposed to remain secluded from the male members outside. However, the women of the weaker section of the society do not have such a restriction imposed upon them and therefore both men and women from the poorer classes use it for different purposes. The chabutra is connected to a dubari (entrance room), which runs from the main entrance to the inner courtyard. It has a simple or stylish wooden door, depending upon the status of the residents.

An interesting associated feature of rural habitation is the place outside the houses, where the droppings or the cowdung are collected, dried, and heaped into a miniature hut shaped structure called bitorah (Plate No.5.3). They are covered with straw or plastered with liquid dung mixed with straw to preserve them from rains. It is the daily duty of the village women to form dung cakes of different shapes and piled them up after drying them. These bitorah are generally found on the outskirts of a settlement. Another notable feature is burji (Plate No. 5.4).

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1 Jhoola (Wooden rectangular plank, tied with strings on four corners, hanging by wooden beams, put transversely on walls or poles).

5.3 Bitorahs: Stored cow-dung cakes.

5.4 Burji: Stored husk

Fig. 5.2 reveals clearly the morphological aspects and the nature of rural dwellings in the region. The basic unit of the rural house is the rectangular rooms, which forms, as before the full dwelling place of several poor families. The one room house has a raised platform in front of it, which is partly occupied by a covered verandah, varies in its size from 4 to 8m and 2 to 4m in length and breadth. The two-room dwelling is an extension of one more room to meet the growing need of more accommodation. Such type of dwellings from an I-shape, whereas the three-room dwelling from L-shape where the third added room is generally used as a baithak (Parlour). The four room dwellings are generally U-shape which provides full benefits of the courtyard and the main entrance. Dwellings with five or more rooms are rectangular or square shape. These houses generally have angan, a verandah, a kitchen and a storeroom.

4.0 HOUSE TYPES AND THEIR DISTRIBUTION

Variations occur in dwellings based on the available and use of building materials, which are mostly conditioned by Physico-cultural and socio-economic factors that offer the regional characteristic to the dwellings. House types of the region are classified into two main categories.

Based on building material used
Based on size and shape

4.1 Based on Building Materials

The type of rural dwellings depends largely on the availability of local building materials, the products of soil and vegetation. The rich built

houses of burnt bricks, cement, concrete and iron sheets while the poor and middle peasants build mud walls and flat clayey roofs of sun dried unburnt bricks and cover it with tiles or thatch. The basic local materials for the construction of rural houses in the District are mostly mud, wood, bamboo, sugarcane leaves and stalks of plants such as arhar etc. Because of the cheap availability of mud or clay., it is widely used in the construction of rural houses in the study area. It can easily be formed into different shapes even without the help of skilled workers and hence the houses built with such materials are simple and economical. All over the area walls are generally made of mud obtained from the village pond. The construction of mud wall is simple and proceeds in stages with damp mud making successive layers of 30 to 45 cm in height. When one layer is completed and dried, a fresh one is added over it. This process continues till the required height is obtained.

Table 5.2 shows various types of wall and roof materials used in the rural houses of the study area. It has been found 32 per cent of rural houses use mud and unburnt bricks as wall material. Similarly, mud and thatch roofing materials contribute 74.66 per cent of the total rural houses. On the basis of the building materials, rural house in the District may be put into the following four District categories:

I. *Grass, leaves, reeds and bamboo walled houses with thatched roof*

Table 5.2

DISTRIBUTION OF HOUSE HOLDS BY PREDOMINENT MATERIALS OF THE ROOOF AND WALL

Materials of wall	Total House holds	Materials of Roof							
		Grass, Leaves, Reeds, Thatches, wood, mud,unburnt bricks or Bamboo	Tiles, slate, shingle	Corrugated iron, zinc or other metal sheets	Asbestos cement sheets	Brick, stone and lime	Stone	Concrete RBC/RCC	All other materials and materials not stated
All materials	100.0	74.66	3.81	0.46	0.41	14.69	0.76	1.27	3.93
Grass, leaves Reeds or Bamboo	3.60	3.48	--	0.01	0.002	--	--	--	2.91
Mud	7.69	5.96	1.64	0.015	--	--	--	--	0.08
Unburnt bricks	24.31	23.49	0.26	0.05	0.014	0.115	--	0.01	0.36
Wood	0.09	0.063	0.003	0.003	0.007	--	--	--	0.013
Burnt bricks	63.39	41.52	1.67	0.35	0.37	1.45	0.45	1.22	3.33
GI sheets or other metal sheets	0.08	0.05	--	0.005	--	0.016	0.003	0.003	0.005
Stone	0.52	0.04	0.14	0.008	0.01	0.003	0.30	0.02	0.003
Cement concrete	0.17	0.04	0.005	0.007	0.003	0.08	0.007	0.02	0.008
All other materials and materials not stated	0.13	0.003	0.096	--	--	0.002	--	0.002	0.03

Source: Compiled from District Census Handbook Meerut, (1991).

These are the common types of rural houses of the poor people. The quality of thatch used totally depends on the availability of local vegetation and crops. Poor people and usually low caste people find it cheaper and more convenient to make thatched roofs of phuns, kans or leaves by fastening them with moist branches of arhar or strings in a rectangular framework of bamboo. This readymade cover is placed over ridgepoles of logs or bamboo. Such kind of houses account for about 3.5 per cent of the total number of rural dwellings of the District.

II. *Mud and unburnt brick walled houses with thatched and mud roof*

Most of the rural people especially the cultivators and agricultural labourers live in these types of houses. Mud walls are constructed with unsorted clay or unburnt bricks and have mud roofs. Chappar, in front of the main entrance is a typical feature all over the region. The poor man's house generally has only one multipurpose room where there is no separate place for cooking, receiving guests or keeping the cattle during the winter night. Such types of dwellings are found all over the study area and constitute 29.5 per cent of the total number of rural dwellings.

III. *Burnt brick walled houses with thatched and mud roofs*

The burnt brick walled houses with thatched roofs cover about 41.5 per cent of the total rural houses. These types of dwellings are found all over the study area. These roofs are cheaper than brick or stone roofs. The

roof may be over hanging on one or both sides, having very gentle slope. These roofs are made by spreading a thick layer of mud over a network of straw or pieces of wood or stalks of arhar, which rest upon closely spaced wooden beams or crooked branches of local trees such as mango and neem etc. Sometimes tiles are also used in the construction of roofs along the other building material. These tiles manufactured by village potters and also baked in the ordinary firewood. These tiles are placed systematically on a framework of wood obtained from local trees, which rests on the gable of the wall supported by transversely fixed beams. Because of these tiles the roof become more durable in the long run.

IV. *Burnt brick walled houses with burnt bricks, stone and lime roofs*

These types of houses are called pucca houses. The brick houses are increasingly in number day by day in the area and it shows the prosperity and higher socio-economic status of the people residing in them. In a pucca house all the four walls and a brick roof have identical appearance all over the area. Brick stairs are also provided in such houses. These houses provide several advantages such as cleanliness and better utilization of space. The roof is used for sleeping purposes during the summer and for drying grains in the sunshine. Although such houses are unevenly distributed all over the area, they are more in number in rural service centres. These are mainly single storeyed houses consisting of

brick walls and pucca roofs. The height of their ceilings is usually between 3 and 4 metre. These houses have separate facilities of latrines, bathrooms, kitchens and stairs. Such types of houses are account for nearly 1.45 per cent of the total number of rural dwellings of the District.

V. *Burnt brick walled houses with concrete RBC / RCC roofs*

Such kind of houses covers about 1.22 per cent of the total number of rural dwellings of the District. Nowadays such a house is a symbol of social prestige. The number of these houses is increasing day by day.

4.2. Based on Size and Shape

The size and shape of a dwelling reflects the economic status of the householders. Its size varies from a large Haveli to a single room hut. It is observed during the field surveys that one or two room houses are inhabited by poor, middle class people lived in three rooms dwellings and the rural rich lived in houses having five or more rooms.

Table 5.3 reveals clearly that one or two rooms dwellings together constitute the highest percentage (63.03 per cent) providing shelter to (59.41 per cent) of the population. In such type of houses men and cattle share the same room. These rooms are easy and cheap to construct but unhygienic because the same room is used for cooking, sleeping and keeping cattle together (Plate No. 5.5). The three or four room dwellings account 26.21 per cent of houses provides accommodation to 28.38 percent

Table 5.3
CLASSIFICATION OF THE RURAL HOUSES ACCORDING TO THE NUMBER OF ROOMS AND RURAL POPULATION LIVING IN VARIOUS SIZE OF HOUSES

Type of house	Percentage of the total number of house	Percent of the total rural population living
One-room	31.13	27.18
Two-room	31.95	32.24
Three-room	16.67	17.84
Four-room	9.54	10.55
Five-room	4.53	5.10
With Six or more rooms	6.18	7.09
	100.00	100.00

Source: Compiled from District Census Handbook Meerut, (1991).

of the total rural population. Five and six room dwellings account for nearly 10.7 per cent of the total number of rural houses and accommodate 12.19 per cent of the total rural people of the District.

The number of arrangement of rooms brings about the general shape of houses. The houses having one or two rooms are I-shaped. L-shape is found in three room dwellings. U-shape dwellings, consisting of three limbs, usually have three or four rooms. Five or more room houses are rectangular in shape. In the District majority of people live in two rooms dwelling.

The house is not merely a shelter but it forms part of cultural heritage and hence is influenced by the cultural environment of which it forms part. So the socio-economic status of the owner has a direct bearing upon the shape and size of the rural dwelling. Field studies reveal that there is a marked contrast between the houses of the well to do and the rest of the villagers. The masonry houses generally belong to the Brahmins, Rajputs, Jats and business class who have a major share in the village land and have accumulated wealth. The rest of the communities live in mud houses. The large masonry houses are well planned with separate facilities of kitchens, bathrooms, storerooms, cattle sheds, fodder stores, chaupals or baithakas. (Plate No. 5.6 & 5.7). Middle class people usually live in houses with 3-5 rooms of burnt or sun-dried brick walls and mud, burnt brick, tiled or stone slab roofs. They have outer and inner verandahs,

5.5 A Multipurpose poor man's dwelling

5.6 A rich man's dwelling

5.7 Farm house of a rich man

5.8 A scheduled caste dwelling

courtyards, cattle sheds etc. Mostly agrarian castes like Lodhas, Kurmis, Yadavs, Muslims etc. live in such dwellings. The poor people like chamar, pasis, Koris, Dheemars, Barbhujwas etc. live in small houses with one or two rooms. The so-called 'untouchables' invariably occupy the worst and relatively isolated locations. These houses are mainly of mud and thatch (Plate No. 5.8). The front verandahs in such houses are multifunctional in nature, used as kitchen, parlour and cattle shed. Smaller size of families and lack of purdah system enable them to live in small houses. A person sitting on the verandah can keep an eye on all property and every movement in the house. Pig rearing is common among Pasis and Chamars who build their pigsties adjacent to their houses. This is the most polluted part of the village.

It has been clearly observed during the field survey that rural housing condition is far from satisfactory. Although the government has made efforts to develop and improve them since independence, these efforts have made very little impact due to meager resources and ineffective organization. In most of the villages majority of houses are one to three room unit built of mud, unburnt brick and thatch. They are constructed in such a way that allows little ventilation. The dwelling complexes have narrow meandering lanes and are overcrowded. The villagers pay little heed to the principles of maintenance of good health and sanitary conditions in the village lanes and bye lanes. Heaps of cattle dung is accumulated at odd

places, which breed mosquitoes and other insects. The rubbish in the houses is thrown on the streets. Children are also allowed to defecate close to their houses, which makes the atmosphere foul and insanitary. Due to the lack of proper drainage system small and big pits full of contaminated water overflowed here and there. The stagnant water in the pits invites mosquitoes, which poses health hazard. The cost of maintenance of mud houses is greater than what is required for masonry houses. The mud houses are more comfortable in summer and winter as they are cooler in summer and warmer in winter. But in the rainy season the masonry houses are decidedly at an advantage. In mud structure the rainwater trickle down and the floors became damp.

The few well-to-do cultivators and other rich people in the village may possess extremely good pucca houses, but their nut living conditions are not always good. For instance, they may have good new baithaks, but their women live and cook in old unventilated havelis. Although the havelis, as the nest of family life, needs most improvement, the survey revealed that the villagers tend to invest their wealth in construction of impressive baithaks, the equivalent of the city dweller's drawing room and guest room.

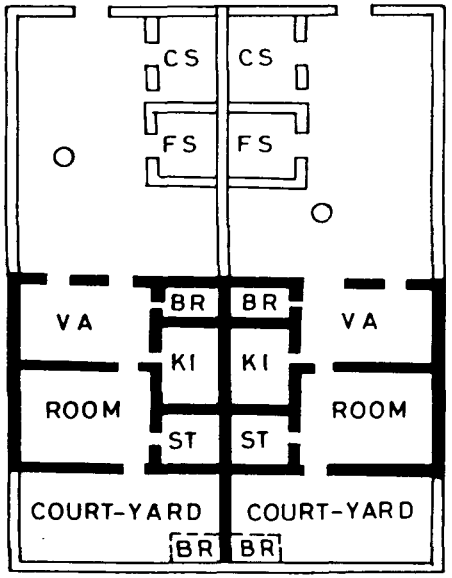
The village sites are already densely built up and fully occupied, and therefore they do not provide any scope for planned physical growth of the village. But in order to improve the housing condition of the villages the

houses should be simple in design and locally available building material ought to be used in their construction.

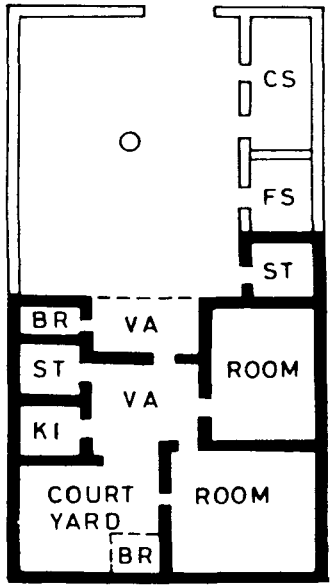
Such a design suggested by the National Housing Board for the poor and middle-income group, has been given in Fig. 5.3. It is a design for single roomed houses, suitable for low-income group (Fig. 5.3A). It provides a multipurpose verandah and a courtyard. The two roomed house plans, as shown in Fig. 5.3B, is suitable for medium low-income groups of people. The special feature of this type of house is the maintenance of the privacy of the women-folk. Fig 5.3C represents the structure of a three roomed house for people of high-income class. It consists of three rooms, a kitchen, a store and a bath. Provision has also been made for a separate cattle shed and a fodder store.

HOUSE PLANS

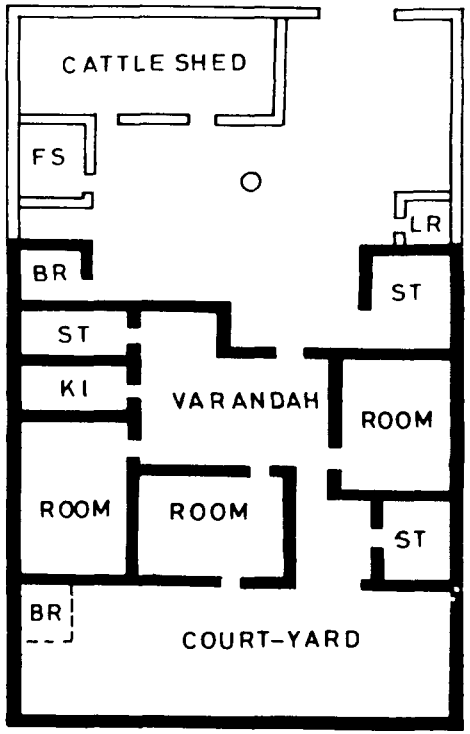
A- ONE ROOM



B - TWO ROOM



C - THREE ROOM



KI — KITCHEN ST — STORE CS — CATTLE SHED
VA — VARANDAH LR — LATRINE ROOM O-OPEN SPACE
BR — BATH ROOM FS — FODDER STORE

0 5 Mts

SOURCE : BASED ON NATIONAL BUILDING ORGANIZATION, 1961

FIG.5·3

CHAPTER VI

SOCIAL MORPHOLOGY: A CASE STUDY OF SAMPLE VILLAGES

CHAPTER 6

SOCIAL MORPHOLOGY: A CASE STUDY OF SAMPLE VILLAGES

The village morphology includes ground plan, general built of settlements and social morphology. The ground plan denotes the layout including length and breadth of streets, the arrangement of house inside the compound of a household and the location of main cultural features as mosque, temple, fort, headman's residence, walls, moats, market place, gardens etc. The built of the village comprises architectural style, general conditions of street, front of houses etc., and lastly its third component, social morphology includes functional and social spaces, which are socially and culturally controlled. In fact, morphological structure, street patterning and arrangement of dwelling and location of secular buildings etc. are all governed by socio-economic and cultural factors. The village community as an integrated living whole "consists of collection of units", arrange to form a social structure, i.e. a set of social relations.[1]

This study aims to investigate the existing morphological characteristics of rural settlements of the two selected villages of different ecological settings in the study area, and to examine the influence of physico-cultural and socio-economic factors, particularly caste and landownership, on the village morphology of the two selected villages in the study area.

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1 Singh, K.N., "An Approach to the study of the Morphology of the Indian Village, in *Rural Settlements in Monsoon Asia*, (ed.), Singh, R.L., National Geographical Society of India, Varanasi (1972). p. 203

1.0 SOCIO-SPATIAL STRUCTURE

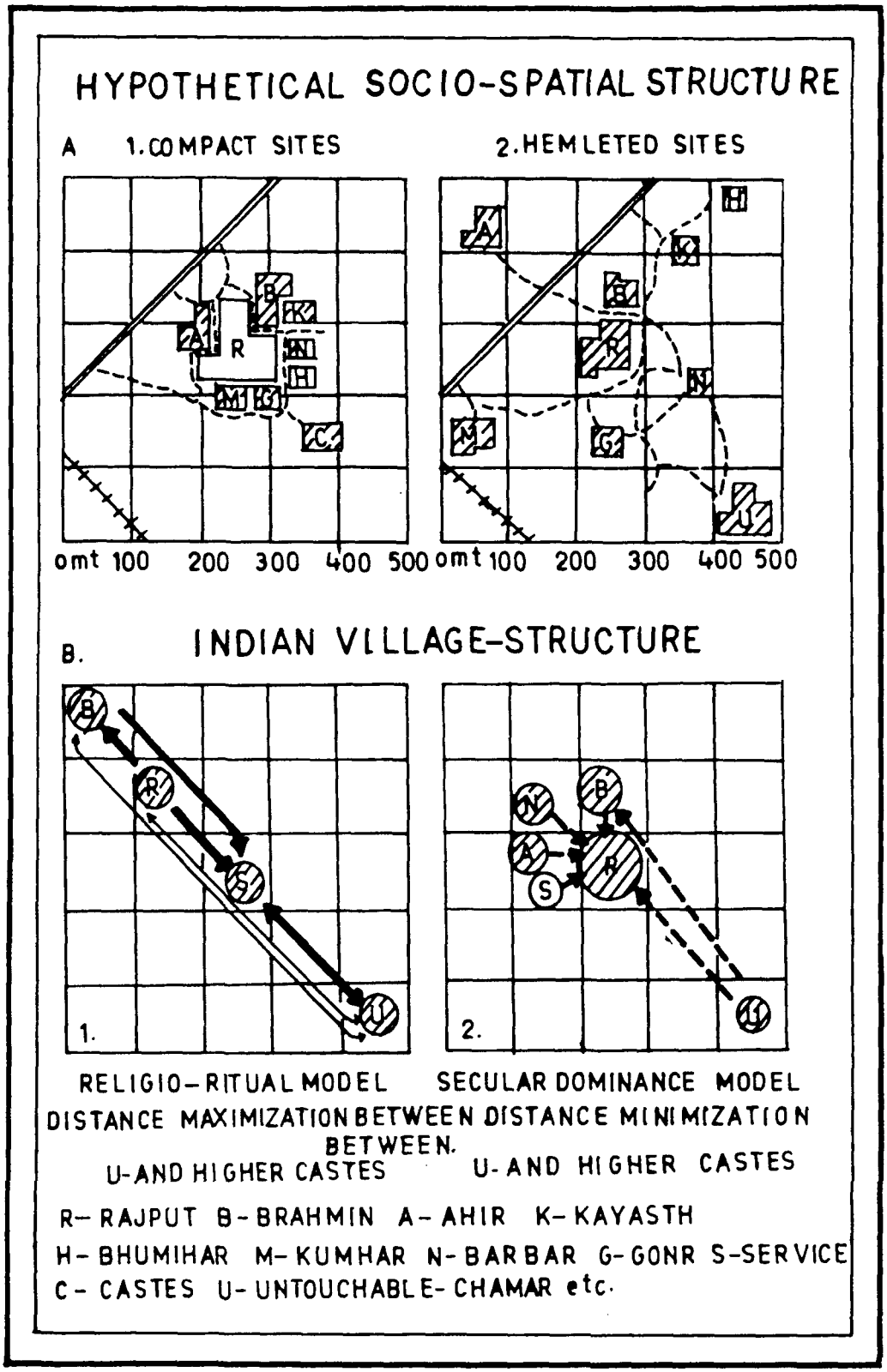
The morphological structure of the sample villages in the study area is mainly determined by their socio-economic as well as physical attributes. Land ownership and caste system have played a crucial role in determining their spatial morphological structure. Field studies of the sample villages have shown that although Brahmins, occupy the highest rank in the social hierarchy, but do not hold the central or the best available sites of these villages, whereas people of the second and the third order of the social hierarchy, such as Kshatriya and Vaishayas, occupy the central or best available sites, and have the largest land holdings in these villages. The lowest strata of the rural society, namely, people belonging to the scheduled castes generally live in congested residences on the periphery of the villages, away from the higher caste dwellings. At times, caste based hamlets also emerge within the village territory, having caste names like Jatpur, Julehra, Singhaoli Ahir, Pathanpur etc., Such hamlets though physically isolated from each other by intervening fields, water bodies, grave land, streets etc., are functioning well-knit together as components of a single unit under the old Jajmani system. Thus, social space and functions are expressed through various morphological patterns, which can be studied on the basis of following models.

1.1 Religio-Ritual Model

The villages have various hierarchy and ranking of jatis still practicing age-old customs and maintaining religio-ritual distances in

behaviour. The Hindu social organization is based on the caste system. Caste is a very important feature in India's life and culture. No other social institution has played such a vital role as that of caste in the development of village society (Fig.6.1A). The Indian society is spilt up into many self-contained divisions of castes in which each caste has its own way of life, with its distinct profession, ideology and behaviour. People of one caste and clan are closely knit together by common traditions and beliefs. They are found very close to each other and work in harmony. Different patterns of religio-ritual distances among various castes and jatis (sub-castes) have been found in the villages of different localities of the study area. The segregationist notions of castes such as purity, pollution, untouchablity etc. maximizes social distances between the higher and lower castes. The stigma of pollution connotes a sense of ritual distance between different castes and determines the spatial arrangement of their respective dwellings in the villages. There exists a Brahmin-untouchable ritual continuum in which all other various castes occupy different niches; these placements, however, in middle rungs of ritually determined social scale, vary in different regional and local structural models.[1] Such caste segregation, being maximum during the early days of settlements, led to the establishment of caste based hamlets in the villages. In case of compact villages, the untouchables were confined to the periphery of the settlements

1 Mandelbaum, D.G. (1970) "*Society in India*", I. University of California Press, Berkeley, Chap. 12.


HYPOTHETICAL SOCIO-SPATIAL STRUCTURE
A 1. COMPACT SITES
2. HEMLETED SITES
omt 100 200 300 400 500
omt 100 200 300 400 500
B. INDIAN VILLAGE-STRUCTURE
1.
2.
RELIGIO-RITUAL MODEL
SECULAR DOMINANCE MODEL
DISTANCE MAXIMIZATION BETWEEN U-AND HIGHER CASTES
DISTANCE MINIMIZATION BETWEEN U-AND HIGHER CASTES
R- RAJPUT B- BRAHMIN A- AHIR K- KAYASTH
H- BHUMIHAR M- KUMHAR N- BARBAR G- GONR S-SERVICE
C- CASTES U- UNTOUCHABLE- CHAMAR etc.

FIG·6.1

in south, southeast and sometimes in the north to maintain the supposed purity of air and village environment. But, this model does not explain other patterns visible in many parts, hence a secular model was adopted.

1.2 Secular Dominance Model

It is the territorial hold by the dominant family or kin group or the jati or the caste in the village through the control of the village land resources, which fulfills the most basic needs of the majority of the villagers by providing the source of food or livelihood, shelter or house site within the village, protection and security of a job, and a position or status in the village society and freedom of movement.[1] The land-owning dominant caste group articulated the settling and socio-economic patterning of the village society. This dominant caste may be a Rajput, Brahmin, Jat, Gujar etc. varying spatially. The functional interdependence generates an atmosphere of co-operation in the countryside in which castes barrier tend to be disregarded in spite of the stigma of untouchablity attached to lower castes (Fig.6.1B). This brings down the distance between these two social groups, making rural settlements compact and unified. But, the village pattern of the past is much affected now and explanation of the additional expansions or relocation needs a separate model.

1.3 Economic Space Model

After Independence villages experienced change in the occupance

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1. The concept of 'dominant caste' was first introduced by M.N. Srinivas in "*The Social System of A Mysore Village*", in Marriot M. (ed.), 1955: village India: Studies in the little community, Chicago University Press, pp. 1-35.

and expansion of various sites irrespective of the factors explained through the two models. The coming of separate tolas, purwas or pattis (hamlets) may best be explained by economic factors, hence, economic space model. In some cases it has been seen that Ahirs spread towards the jungle area to avail maximum benefit of stock raising and cultivation of their own field, Chamars came along the road to enjoy the free front of the road avoiding congestion of the main settlement and others are occupying temporary bases (pump-set locations). Road has attracted various caste people for economic gains. This roadside expansion is new phenomenon in rural countryside resulting from development of transportation means, hence, job opportunity.

The following two villages have been selected randomly to present the actual picture of various aspects of rural settlements and their social morphology. These are Medpur and Meghrajpur.

2.0 VILLAGE MEDPUR

The village lies in the Rajpur block of the Meerut district at 28°58' north latitude and 77°47' east longitude. It is situated about 13.5 km from the tehsil headquarters. The approach to the village is easy and convenient. While traveling on the Garh Road towards southeast, just after crossing the Kali Nadi (east) there fall a village named Gokulpur on the left side of the road then comes a big gate after the premises of the village then we will

take a turn towards this village and the metalled road through the gate goes right up to the village Medpur. On the way a village named Datauli also falls. In addition, the village is linked to surrounding villages by three other metalled roads. Like all villages of the study area, Medpur depends mainly on agriculture. According to 1991 census, the Medpur has a population of 2660 persons, out of which 1420 are males and 1240 are females.

Historical Set-up

According to the old people the village derives its name from a Gujar named Med who lived here about 250 years ago. A Rajput who came from Haryana drove him out. He married a girl of Buxor Gai village in the north east of Medpur. Later on he embraced Islam and changed his name to Hayat Khan but his first wife and sons remained as Hindus.

Physical Set-up

Village, unlike towns and cities, seldom experience any major changes in their aerial extent. The main reason for this slack physical expansion is the out migration resulting from saturation of the agricultural sector, absence of any other employment opportunities in villages, and increased literacy in rural areas.

Its flat level plain governs the spatial morphology of the village and the Kali Nadi (west) flows in the northwest of the village. This is a compact village having a roughly rectangular pattern.

Functionally the houses can be grouped into three types: ghar (residential quarters), gher (place used as cattle shed and for storing fodder etc.) and ghar-gher (used for all purposes). The ghers are mostly built in the outer margin of main inhabited site in the western part while the other parts are occupied by residential quarters. There are 15 shops, which cater the daily needs of the villagers. The villages have one government primary school and one Ambedkar primary school and a madarsa. It has a temple and two mosques located in the Hindu and Muslim localities respectively. There is one privately run dispensary.

There are about 357 occupied residential houses in the village. Out of the total houses, 85% are pucca, with flat roofs, while 5% are Kaccha, made of mud walls and flat mud roofs. The rest of the houses i.e., 10% are of the mixed type. This does not mean that this proportion is true some 10 years back, actually the reconstruction of kaccha houses into pucca ones has gone on at a pace. This high percentage of pucca houses reflects the economic well being of the villages. On an average 6-7 persons are living in one house. Housing condition in the village is moderately good, although there is no set plan. Most of the houses have two Kothas (medium size rooms) with a dalan (verandah), one kothari (small room) and angan (court yard). Member of chief land owing castes of the village owns over half of the village. They mostly live in spacious pucca houses with big courtyards. People belonging to other communities like Chamar, Harijan and Dhimar,

Dhobi, Barhai etc., live in one or two room houses with out any provision for ventilation or sanitation. About 80% of the houses have a separate kitchen and they are using cooking gas as well. Most of the houses have a separate toilet because majority of the people in the village are upper caste Muslims and they observe purdah. There are about 220 private hand pumps while 14 belong to government.

Brick paving of all the street and cemented open drains are other notable changes, which occurred during the sixties, but their maintenance and sanitation expose a very sorry state of affairs.

Economic Set-up

In the village of Medpur agriculture is still the mainstay of the village economy. The primary sector dominates the economic structure of the village. Cultivators (206) and agricultural laborers (254) constitute the primary sector. The cultivators are further subdivided into three categories, namely, landowners, land-owners-cum-tenants and tenants. The numbers of landowner-cultivators with large holdings and of pure tenants are quite negligible. On the other hand, there are landowners with small landholdings some of whom do not cultivate their land themselves.

Before 1947, the Muslim Rajputs were the large landowners; poor Muslim Rajputs and non-scheduled castes, landowners-cum-tenants and the scheduled castes were the agricultural labourers. The Rajput

landowners, except, for a very few of them being very status-conscious could not make any progress on the economic front and were compelled to sell their land.

The use of modern agricultural innovations in terms of power, fertilizers, improved seeds, mechanization, credit facilities, marketing, etc has helped to increase production considerably and has brought the total land of the village under plough and double cropping. Large-scale mechanization is not possible due to the small size of the landholdings.

The existence of secondary and tertiary workers does not mean that secondary and tertiary activities do exist in the village, except for a few shopkeepers. The recorded secondary and tertiary sector workers work in nearby urban centres like Delhi, Meerut city, Mawana town. The secondary and tertiary activities accounts for 25.8 per cent of the total workers, which represents a good combination of employment in different activities.

Social Morphology

The Muslim Rajputs are the dominating caste in the village. More than half of the population belongs to this community. They are occupying the best possible sites like whole of the western and central parts. In the north the three houses of Gararia are located near Rajputs Gher. There are two houses of Brahmins located near the temple in the northeast corner of the village. About eight houses of Baniyas surrounded the temple. The

houses of Scheduled castes Bhangi are found in the southeastern corner of the village built up area while Chamars are found in the southeastern parts adjacent to Bhangis. The backward Muslims are found in northeastern portion of the region near masjid, which caters their religious needs. All the above-discussed models are quite applicable in this village as the best sites are occupied by higher castes like Rajputs, Brahmins and Baniyas. The scheduled castes live in congested residences usually on the periphery of the villages, away from the higher caste dwellings. But the village scene is changing gradually. Community life is being replaced by individualism. The behavioral change in the nature of the society is due to the changing economic forces (Fig. 6.2).

Administrative Set-up

The local village government, known as Gram Panchayat, looks after the village administration. The Gram Panchayat consists of 15 elected members with one as the leader of the team, known as the Sarpanch. The sarpanch, being a mature person with administrative skills, could manage the village affairs quite smoothly. Dirty streets, abandoned street lights, distillation of illicit liquor, conflicting resources, disputes, infighting among the local members mark the order of the day, which indicates the inefficiency of the Gram Panchayat in safe guarding the public interest. This, of course, is a serious issue demanding immediate action. The present state government wants to give more judicial powers to the Gram

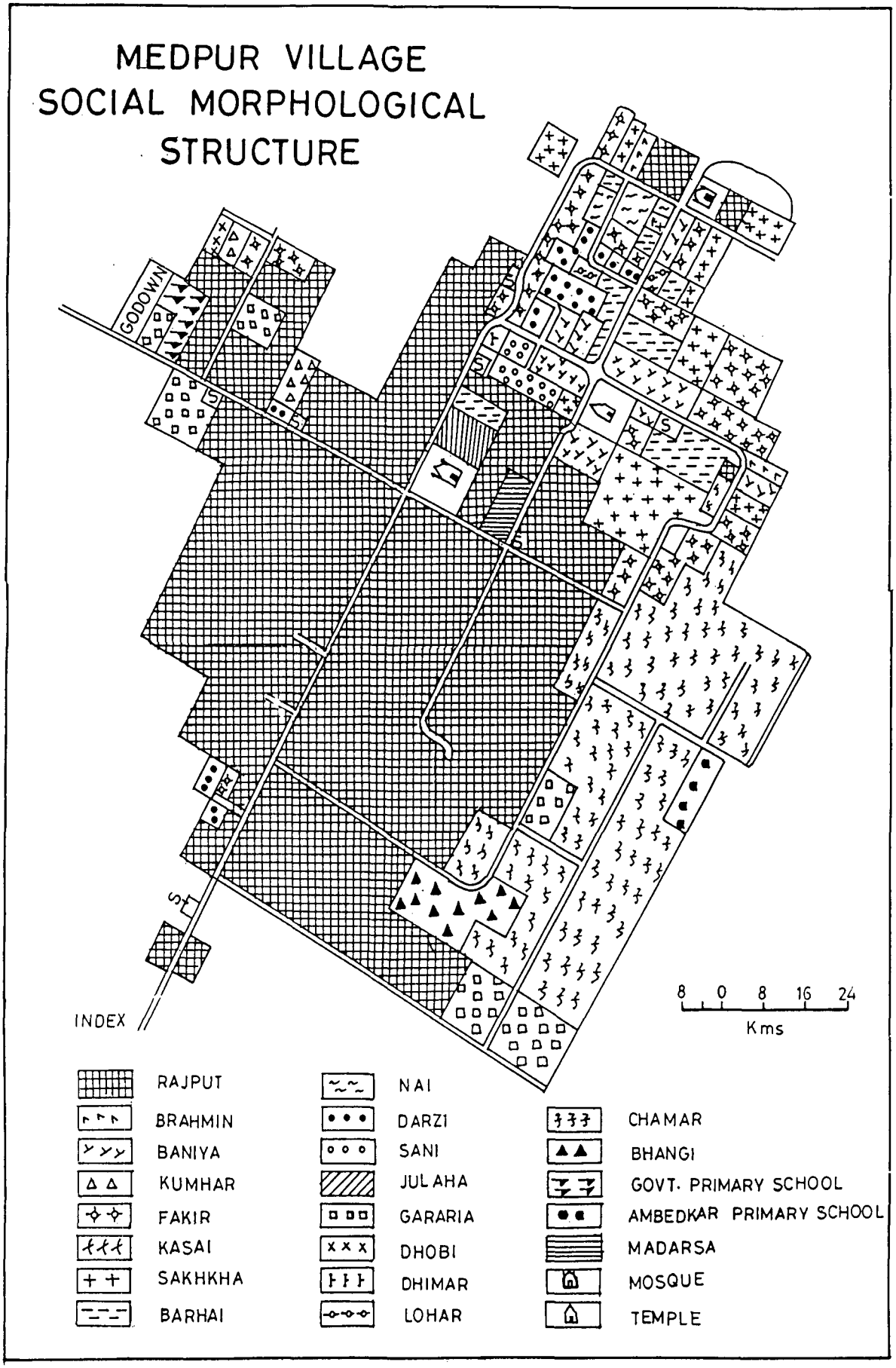

MEDPUR VILLAGE
SOCIAL MORPHOLOGICAL
STRUCTURE
GODOWN
INDEX
8 0 8 16 24
Kms
RAJPUT
BRAHMIN
BANIYA
KUMHAR
FAKIR
KASAI
SAKHKHA
BARHAI
NAI
DARZI
SANI
JULAHA
GARARIA
DHOBI
DHIMAR
LOHAR
CHAMAR
BHANGI
GOVT. PRIMARY SCHOOL
AMBEDKAR PRIMARY SCHOOL
MADARSA
MOSQUE
TEMPLE

FIG.6.2

Panchayat. The present system of structuring the Panchayat and their functioning should be thoroughly investigated. The Panchayats need to be constituted so that they can deliver the goods. Otherwise the judicial powers vested with them will be liable to misuse and can add further dangers to village life. If not all the members, at least the Sarpanch should be an educated and mature person.

Infrastructural Set-up

Since the village contributes the lion's share in the state economy, the state government is taking a keen interest in upgrading rural areas, villages are being provided with the required infrastructure as and when funds are available. But the infrastructural facilities lack rationality in their distribution. In some cases, it is just a matter of chance that a particular facility is given to a village, in other case it is due to political pressure. Rural life has been improved, but the way in which the facilities are bound to be limited.

Two primary schools, 14 government hand pumps, a pond in the north west of the built up area which is used for Pisciculture, street lights (though not all functioning) and about 15 shops fulfilling daily needs. In addition services of four medics are also available.

3.0 VILLAGE MEGHRAJPUR

The village lies in the Machra block of the Meerut district at 28° 54' north latitude and 71°54' east longitude. It is situated about 16 km from the

tehsil headquarters. A metalled road running between the town of Garhmukteshwar and the city of Meerut passes through the northern part of Meghrajpur and joins the village with the markets of Garhmukteshwar and Meerut, which are about 12 and 9 miles in the east and west respectively. Besides, there is a metalled road, which divides the village from north to south and connects Meghrajpur with Bhatipura village where markets are held on every Saturday.

The village also falls on the Garh Road after crossing the Chhoiya Nadi moving ahead towards the southeast. The village is linked to the surrounding villages named Mau Khas, Bhatipura Manakpur, Rachhoti by metalled roads and Nagla Mal by unmetalled road. Agriculture is the mainstay of the village.

Historical Set-up

The story, as told by the elderly in the village, is that about 600 years ago the two brothers named Megha Singh and Raj Singh came and settled here from Beri-Bhiwani, some place in Haryana. The village derives its name from these early settlers. They were Brahmins by caste. From the very beginning this village belonged to Brahmins but the landowners were the Baniyas popularly known as Patharwale. They lived in Meerut city and have landownership in other villages also. At some time they had a dispute with Brahmins and filed a court case, obviously the Patharwale won the

case. Due to their defeat Brahmins left the village and migrated to nearby villages - Bhatipura, Silarpur, Maukhas, Singhpur, Sikri, Hasanpur and Nagla Mal. It is also said that when Brahmins left this place they gave a curse that who will got the landownership will not bear a male child and this happened so, to some extent till the abolition of zamindari.

Physical Set-up

Meghrajpur is bounded by the villages of Bhatipurs in the north, Hasanpur in the east, Nagla Mal in south and Mau Khas in the west. Meghrajpur lies in a well-drained plain at the height of about 717 feet. The Chhoiya Nadi, a seasonal stream, flows through the southwest corner of the village. In the wet monsoon months this stream provides an outlet for draining the surplus water. In the years of excessive rainfall the Chhoiya Nadi overflows its bank and inundates the southwestern part of the village. This is a compact village having a roughly rectangular pattern. Functionally the houses can be grouped into three types: ghar, gher and ghar-gher. The ghers are mostly built in the outer margin of main inhabited site. In this village it is also true. There are two ghers in the village belonging to Brahmins and located in the northwestern part of the built-up area. The other parts are occupied by residential quarters. There are 15 shops, which sold everyday goods. Out of them two are well maintained similar to the shops of urban areas. There is one tea stall, a cycle repairing centre, a tempo stand and a Sugar cane processing unit locally called Kalesar plant

is also located on the Garh Road. The village has one primary school and a junior high school (under construction) where classes have been started for two year. It also comprise of three temples and a mosque found in the Hindu and Muslim localities respectively. There is one tailor shop and one privately run dispensary.

The village consists of 255 occupied residential houses. Out of them 87 per cent are pucca with flat roofs. While 5% are Kaccha, made of mud walls and flat mud roofs. The rest of the houses, i.e., 8 per cent are of mixed types. There is one old deserted mound. Few years back all the kaccha houses were replaced by pucca houses. The high percentage of pucca houses has gone on at pace. The nature of pucca houses reflects the economic well being of the villagers. The average persons per house are 6. Lanes and byelanes intersect the village. Housing conditions in the villages is relatively better, but does not have any set plan. Most of the houses have two kothas (medium size rooms) with a dalan (verandah), one kothri (small room) and angan (courtyard). About 50% of the houses have a separate kitchen. All the roads are paved with bricks. There is a proper drainage system, but in rainy season the drains over-flow leaving the condition worsen. There are four masonry wells and water level is at 50 feet.

Economic Set-up

Agriculture is the main occupation in this village. The primary sector accounts 97 cultivators and 205 agricultural labourers. Before the abolition

of zamindari the Vaish family popularly called Patherwale were the landlords but after the abolition of zamindari in 1953 the whole scenario was changed. The zamindars were compelled to sell their lands and their land share reduced considerably. The other rural richs are the Brahmins, belong to a single clan spread over ten house in the village where they posses half of the cultivated land. The Patharwale have 16 Bigha land and rest of the land belong to Chamars, which is the largest community in this village. They have got the land under Ambedkar Scheme. A small portion of the land belongs to other communities. Except for a few shopkeepers and schoolteachers, the recorded secondary and tertiary sector workers work in nearby urban centres that account 50.49 percent of the total workers.

Social Morphology

The Jatavs are the single largest community consisting about 35 per cent of the total population of the village. They have occupying almost the whole of the eastern part of the built-up areas. There are six households of Balmikis also living with the Jatavs. Brahmins, occupying the central position of the village, have their own separate temple for their religious activities. There are six houses of Jats located in the northern part of the village. Muslim backwards are scattered around the mosque lies in the northwestern part of the village. The Muslim backwards are comprises of Lohar, Barhai, Darzi, Teli, Dhune, Dhobi. The Brahmins occupy the highest rank in the social hierarchy. The have hold the best available site and

largest land holdings of the village. The schedule castes have occupied the peripheral position on the eastern part of the village. After Independence it is seen that the stigma of caste influence has lost its importance over economic gains and it become the potent one (Fig. 6.3).

Administrative Set-up

The Gram Panchayat, consists of 11 elected members, looks after the village administration. The village Pradhan, a lady belongs to Jatav community, is running the village administration very smoothly with the help of her male supporters. In Meerut district, out of a total number of 704 Gram Pradhans, 33 per cent are women.

Under new Panchayati Raj acts. Many new scheme of development has been introduced in the village to alleviate poverty, selection of beneficiaries, imposition and enhancement of taxes etc. The most important programme given to the Gram Panchayat is resource planning. The Gram Panchayat prepares an inventory of human, physical and other available resources for the development of village. Some agitating problems of villagers are garbage disposal, adequate toilets, unemployment, law and order, electricity fluctuation, etc. All the inadequacies adversely affect the living and functions of the farmers in the village.

Infrastructural Set-up

The village has a mosque, three temples, one primary school and one junior high school. There is only one private dispensary run by a quack.

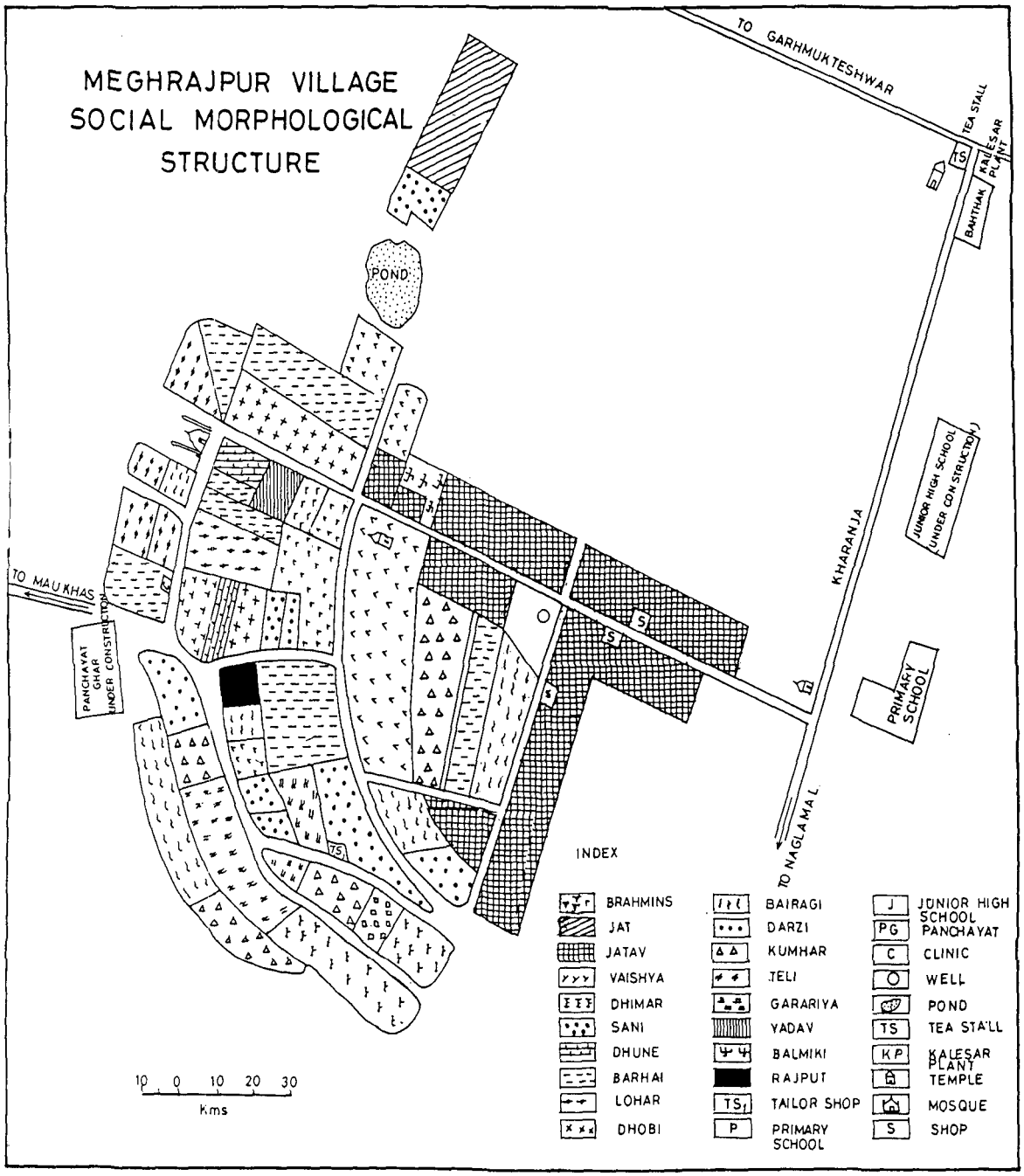

MEGHRAJPUR VILLAGE
SOCIAL MORPHOLOGICAL
STRUCTURE
TO GARHMUKTESHWAR
TEA STALL
KALESAR PLANT
BARTHAN
POND
TO MAUKHAS
PANCHAYAT GHAR UNDER CONSTRUCTION
KHARANJA
JUNIOR HIGH SCHOOL (UNDER CONSTRUCTION)
PRIMARY SCHOOL
TO NAGLAMAL
INDEX
BRAHMINS
JAT
JATAV
VAISHYA
DHIMAR
SANI
DHUNE
BARHAI
LOHAR
DHOBI
BAIRAGI
DARZI
KUMHAR
TELI
GARARIYA
YADAV
BALMIKI
RAJPUT
TAILOR SHOP
PRIMARY SCHOOL
JUNIOR HIGH SCHOOL
PANCHAYAT
CLINIC
WELL
POND
TEA STALL
KALESAR PLANT
TEMPLE
MOSQUE
SHOP
10 0 10 20 30
Kms

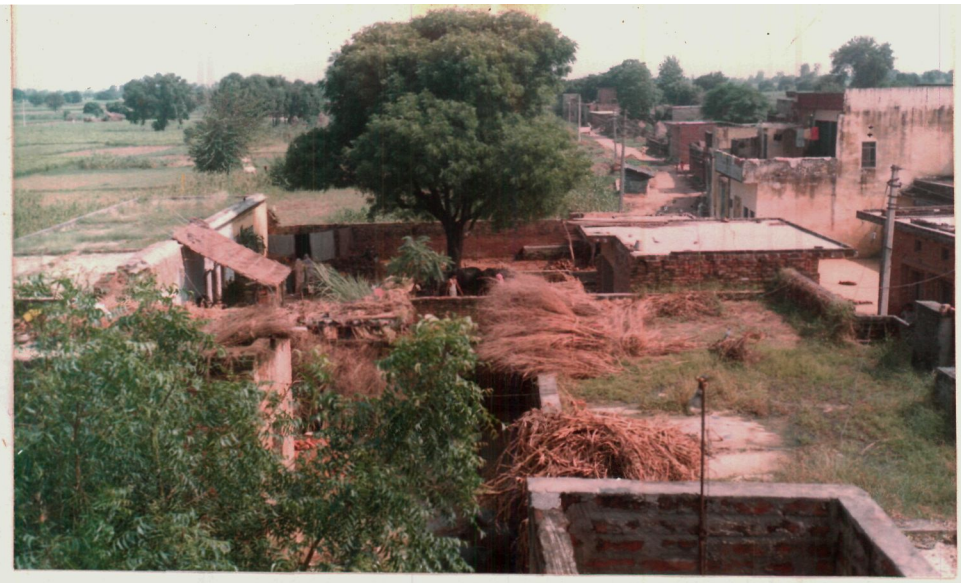
FIG. 6.3

People usually go to Bhatipura Primary Health Centre, Machra and Meerut for medical treatment. There is only one primary school building in which 250 children are enrolled. Two female teachers and three male teachers serve the purpose very well. Although the building of junior high school is under construction, where the classes have been started since last year. The students are 30 in number.

For further studies at high school, graduate and postgraduate level they go to Mau Khas, Machra and Meerut College respectively. There are five well maintained shop which sell every day goods, one tailor shop, one tea stall at the Garh Road, a Kalesar plant situated on the right side of the Meerut - Garh road, one cycle repairing shop and a tempo stand on the road. The villagers go to nearby villages for shopping since, weekly market is not held in the village. Weekly market is held at Bhatipura, Maukhas, Hasanpura, Hasanpur, Rachhoti, and animal hat is held at Medpur, Shahjahanpur, Mundali. There exist two ponds one in northern part and other in the southwestern corner of the village.

The foregoing analysis of the socio-spatial morphological structure of the two selected villages of the study area, i.e., Medpur and Meghrajpur shows the existence of the habitations of most of the people belonging to services castes near to those of the higher castes, thus forming a closely knit social structure. This is due to the economic dependency of the former on the latter groups of castes under the Jajmani system. The analysis of the

spatial patterning of different castes reveals that segregation is closely associated with the caste of the inhabitants, resulting in the formation of distinct settlement units. Thus the pattern of the religio-ritual-cum-functional interactions is the factor that is responsible for spatial distribution of different castes, which is exhibited, in the socio-spatial organization of the sample villages.



6.1 Medpur: A General view

6.2 Medpur: A temple

6.3 Medpur: A scheduled caste Habitation

6.4 Meghrajpur: A General view.

6.5 Meghrajpur: An old mound

6.6 Meghrajpur: A Mosque

6.7 Meghrajpur: A primary School.

CONCLUSION

CONCLUSION

After foregoing discussion regarding the evolution of rural settlements and their spatial variations in Meerut District, it may be concluded that the District is primarily agricultural in composition. Its rural society is tradition bound and the caste system still plays a dominant role in it, though winds of change have started blowing across it, which have begun to affect the rigidities of the hierarchy of castes.

The region has a very long history of settlement and has witnessed many phases of settlement growth and retreat, the last of which began with the Rajput colonization at the beginning of the twelfth century A.D. when the Tomars, belonging to a Rajput clan, established their kingdom in Delhi, and Dor Rajputs, who was his vassal held sway over the town.

The distribution of rural settlements is influenced by various factors. Out of the several physical, social, economic and political factors a few factors are more responsible for the distribution of rural settlements. However, the settlement distribution is not only determined by the natural conditions but also influenced by socio-economic factors.

The quantitative analysis of spacing of rural settlements at block level has revealed that there is a direct relationship between spacing and the size of settlements. It is obvious that where spacing is high villages are of larger sizes, with a small number of hamlets having higher densities of

population, which results in compact structure of settlements. On the contrary in areas of low spacing, settlements are generally smaller in size with low pressure of population and scattered distributional pattern, viz., hamleted type of settlements.

The study of deviation from random situation, on the basis of first order nearest neighbor distance approximation analysis of rural settlements has revealed that settlements are more regular than random. Hence the Regular Poisson Probability Law is quite applicable in the case of settlements in the study area.

An analysis of the shapes of the villages show that the average shape index of the study area being 0.638. About 17 percent of the villages conform roughly to rectangular or square shape. 0.1 villages have elongated shape while nine villages approach nearly circular shape.

Contact index, population density and areal size did not show any significant co-relationship due to existing almost homogeneous environmental conditions in the region.

Transformation of village shape into Dirichlet / Thiesson Polygons and Hexagons ought to be taken into consideration, while making plans for rural development. It has been found that village sites are mostly determined by physico-cultural factors where as market centres have developed at the intersection of roads or along the roads. As the number of

market centres increases the services area of individual market centres decreases. Increasing Christaller's K values may be taken as an index to represent better efficiency of purchasing power and development on the one hand and transport connectivity of a region on the other, which should be taken into account while making plans.

The morphology of the rural dwellings in the study area shows that the building materials and the architectural styles are the expression of the physical factors of the region, whereas the ground plans are closely related to the socio-economic conditions of the residents. Mud or clay, is widely used in the District, because plenty of cheap clay is on hand to construct walls and roofs. The size of a dwelling reflects the economic conditions of the dwellers. The poor people inhabit one or two room houses while the middle class people have three to four rooms dwellings and rich people live in houses having five or more rooms. The condition of rural houses in the study area is far from satisfactory. They are constructed in close proximity to each other, allowing little ventilation. Bad housing and lack of planning lead to unhealthy social habits, insanitary conditions, foul smell, etc, which increases the risk of diseases and infections.

The social morphological study of two selected villages (built up areas) reveals that the economic power of the people rather than caste plays a decisive role in the selection of best available site for settlement.

The analysis of the spatial patterning of rural dwellings of different castes shows that segregation is closely associated with the castes inhabited in the villages.

To improve the living conditions of the rural people and their settlements, it is important to comprehend the socio- economic of the people and the potential resources of the villages. The rural settlements are tradition bound and its nature of built-up area is spontaneous. They are closely knit together through invisible thread of social fabric, and inter dependent to one another to carry out their socio-economic business. Breaking of joint family system, pattern of existing dwellings, fragmentation of land holdings, social conflicts are some of the causes for haphazard growth and mushrooming of settlements in countryside. In view of the above facts some of the important suggestions based on field experiences have been made to obtain the sustainable development of the countryside. These are as follows:

1. In order to improve housing conditions, house should be simple in design. Bricks that can be locally manufactured at the same time generating local employment can replace mud walls.

2. The congestion of houses may be relieved by providing extension sites for them. This can also be achieved by filling up the stagnant ponds and pits lying near the settlement sites.These pits and ponds served useful

purpose in medieval and ancient days but now they are turned into breading grounds of mosquitoes.

3. All the villages and hamlets should be connected with brick-lined road with a view to maintain cooperation among the different sections of the society and improvement of their socio-economic conditions.

4. The sewage system needs improvement by providing soak pits for individual houses and the pucca drainage for the streets, but both should be cleaned periodically.

5. Cattle pens and sheds should by keep little away from the dwelling sites attached to it with a view to good sanitation.

6. There should be provision of dry latrines near the inhabited sites to avoid the unhygienic practise of defecating in the open fields.

7. Transformation of village shape into Dirichlet / thiessen polygons and hexagons should be taken up as one of the measures for the planning of rural development.

8. Extension of safe drinking water through more tubewell installations.

9. Electric connections should be extended to every bit of the region.

10. Provision of better education, health for all, and popularization of family planning measures, so that dependency burden on workers can be lessened.

11. In areas of water transport, better facilities as well as mechanization of boats should be done, in order to bring in a speedy communication system.

12. The illegal gathering of forest produce should be regulated by introducing social forestry, small-scale industries or handicrafts, generating rural employment and income.

13. Last but not the least, the present study has highlighted only a few aspects of rural settlements geography. Planning will be facilitated if further research is oriented to find out the process of human adjustment to environment. There should be an indepth study of linkage between process of settlement and its structure in settlement pattern to devise spatial organization for optimum mobilization of resources. Detailed data on migration are necessary, at village level to know the process that controls the structures. Similarly, detailed economic data are needed to analyse the growth or decline of rural economy to facilitate proper planning of rural settlements.

National and International development policies are giving higher priority to distribute the benefits of development to the poor and other disadvantaged, through a combination of accelerating overall growth and distributing more of the benefits directly to these groups. For the development of human settlements the available resources should be used efficiently and to its optimum level to provide jobs, goods, and services to the needy people of the rural areas; since poorest of the poor lives there. National and international development efforts seek to increase agricultural output and rural employment and incomes, the spatial focus of settlements

policy must expand to include rural settlements as well as urban settlements. One way or another, the inhabitants of rural settlements should be provided with at least minimal facilities for safe drinking water, primary health care and education, marketing and storage facilities for agricultural produce and inputs, and opportunities to earn enough income, whether in cash or in kind, to provide adequate food, clothing and shelter. In addition, national settlements policies and plans should strive to provide the rural population with access to a wider variety of occupations and cultural facilities so that ambitious, educated rural people will be able to find challenges and rewards commensurate to their abilities.

GLOSSARY

GLOSSARY

Local Names	English Names
Abadi	Inhabited part of the village site
Angan	Open Court-yard at the house
Babool	A moderate size of Accacia arabiea evergreen tree.
Baithak	Resting place.
Ban	Twin made of moonj
Banjar	The Cultivable waste land
Basti	Settlement site
Bhangar	Old alluvium
Bhur	Light soil
Bigha	A local land measure equivalent to 0.625 acre.
Biri	Indigenous cigarette made of leaves of tendu tree and tobacco
Bitorah	The cowdung collected, dried and heaped into a miniature hut.
Black-And-Redware	According to B.B. Lal, "Pottery whose interior and the top part of the exterior is red. The colour effect is produced by putting the pot upside-down in the kiln. In India such pottery appeared early as 2000 B.C. and continued, of course, with modificaticns, up to the beginning of the Christian era.
Brahma	The Hindu God Supreme
Brahmins	Highest, Hindu caste, India

Burji	Stored husk in a miniature hut.
Chabutra	A raised platform in front of the main entrance, India
Chak	Block of land
Chamar	A low caste community, India
Chamartoli	Hamlet of Chamars
Chappar	Thatched roof
Chauhan	A ruling dynasty and a Rajput clan.
Clan	Exogamous group claiming descent from a common group.
Dastur	District (during the Mughals)
Deorhi	In the context of Newsletters, it means the camp of a ruler or chief of the move.
Dih	High land due to deserted settlement site.
Doab	Land between the rivers
Dubari	Entrance room of the house
Gaon	A village settlement
Garhi	A mud fortress, a castle
Ghat	Platforms or step at edge of lake or river water.
Gher	Female House
Gur	Jaggery
Hat	Market place
Haveli	A large masonry house.
Jagir	Land or villages given by state as a reward for services. It was made for a life time and it was nor inheritable. The holder of such grant is known as Jagirdars.
Jajmani	A system involving reciprocal relation, India.

Jhil	Small lake
Jori	A field system
Jungle	Forest
Kaccha	Unmetalled
Kankar	Calcareous nodules
Khadar	Lowlying land along river, new alluvium.
Khadi	Hand spun and Hand woven cloth
Khandsari	Indigenous white sugar.
Khanqah	Muslim religious establishment
Kharif	Season of summer crops (mid June to October)
Khasgaon	Main village settlement
Loo	Hot wind
Mahajan	Money lender
Mahal	A fiscal unit, a subdivision of sarkar
Mahal	Palace, hall.
Mandi	Big market or Bazar
Maqbara	Tomb or Mausoleum
Maufi	Rent free land
Mauza	A revenue village
Moonj	Kind of long reed of which ropes are made
Muhalla	Residential locality
Mukhia	Village headman
Nachiragi or Bechiragi	Without habitation
Nadi	River
Nala	A seasonal stream
Neem	A tropical tree
Niwar	Thick, wide, cotton tape

Northern-Black-Polished-ware:	According to B.B. Lal " A distinctive pottery with a highly lusturous surface, usually black but some times steel-grey, silvery or golden. It is wheel made, normally thin-sectioned and well fired, giving a metallic ring. Main concentration in northen India. Date 600-200 B.C."
Ochre-Coloured-Pottery:	According to B.B. Lal "Orange to deep-red pottery, found so far mostly in warm-out condition to the extent that the surface rub off by mere handling, leaving an ochrous colour on the fingers, hence the name. Extent upper Ganga valley-prior to 1200 B.C."
Pargana	Administrative division of a tehsil
Patti	Tract of proprietary land
Phuns	Dried coarse grasses used in making thatched roof.
Pucca	Metalled
Puras	Hamlet
Purdah	Veil
Purwas	Hamlets, also puras
Rabi	Season of winter crops
Rajput	Highest Hindu caste after Brahmins
Reh	Salt efflorescence
Sarkar	A fiscal unit, sub-division a suba (province)
Shashtras	Religious literature of Hindus
Shikar	Hunting expeditions
Shudras	Lowest caste people in India

Suba	Administrative unit during Mughal period
Sutli	Twin made of hemp
Tappa	A unit of land-revenue administration, smaller than a pargana
Tehsil	Administrative division of a district
The Arya Samaj	is a sect, the movement being started in Meerut by Dayanand Saraswati when he visited the district in 1878.
Tola	Hamlets
Urs	Anniversary of saints
Usar	Land full of sodium salt which renders it unfit for cultivation (saline alkali or Alkali soils).
Zamindari	A land tenure system.

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